

REGULATION

R2020



PRIST
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UNIVERSITY
NAAC ACCREDITED
THANJAVUR- 613 403 - TAMIL NADU

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REGULATION - 2020

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I - VIII SEMESTER CURRICULUM AND SYLLABI

B.TECH (FT) MECHANICAL [Regulation 2020]

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S11	Communicative English	4	0	0	4
2.	20148S12	Engineering Mathematics - I	4	0	0	4
3.	20149S13	Engineering Physics	3	0	0	3
4.	20149S14	Engineering Chemistry	3	0	0	3
5.	20154S15	Engineering Graphics	2	0	4	4
6.	20150S16	Problem Solving and Python Programming	3	0	0	3
PRACTICAL						
7.	20150L17	Problem Solving and Python Programming Laboratory	0	0	4	2
8.	20149L18	Physics and Chemistry Laboratory	0	0	4	2
9.	201VEA19	Value Education				1
TOTAL			19	2	12	25

SKILL DEVELOPMENT

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S21	Technical English	4	0	0	4
2.	20148S22	Engineering Mathematics II	4	0	0	4
3	20149S23C	Material Science	3	0	0	3
4.	20149S24A	Environmental Science And Engineering	3	0	0	3
5.	20153S25D	Basic Electrical, Electronics And Instrumentation Engineering	3	0	0	3
6.	20154S26D	Engineering Mechanics	3	2	0	4
PRACTICAL						
7.	20154L27	Engineering Practices Lab . (All Branches)	0	0	3	2
8.	20153L28D	Basic Electrical, Electronics and Instrumentation Engineering Lab	0	0	3	2
9.	201ICA29	Fundamentals of Indian constitution and Economy				-
TOTAL			20	2	6	25

SKILL DEVELOPMENT

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S31C	Transforms and Partial Differential Equations	4	0	0	4
2.	20154C32	Engineering Thermodynamics	3	2	0	4
3.	20154C33	Fluid Mechanics and Machinery	4	0	0	4
4.	20154C34	Production Technology - I	3	0	0	3
5.	20154S35	Electrical Drives and Controls	3	0	0	3
PRACTICAL						
6.	20154L36	Production Technology Laboratory - I	0	0	3	2
7.	20154L37	Computer Aided Machine Drawing	0	0	3	2
8.	20154L38	Electrical Engineering Laboratory	0	0	3	2
9.	20154L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
TOTAL			17	2	11	25

SKILL DEVELOPMENT

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S41D	Statistics and Numerical Methods	4	0	0	4
2.	20154C42	Theory of Machines-I	3	0	0	3
3.	20154C43	Production Technology – II	3	0	0	3
4.	20154C44	Engineering Metallurgy	3	0	0	3
5.	20154C45	Strength of Materials for Mechanical Engineers	3	0	0	3
6.	20154C46	Thermal Engineering- I	3	0	0	3
Practical						
7.	20154L47	Production Technology Laboratory - II	0	0	3	2
8.	20154L48	Strength of Materials and Fluid Mechanics and Machinery Laboratory	0	0	3	2
9.	20154L49	Advanced Reading and Writing	0	0	2	1
TOTAL			19	0	8	24

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C51	Thermal Engineering- II	3	0	0	3
2.	20154C52	Design of Machine Elements	3	0	0	3
3.	20154C53	Metrology and Measurements	3	0	0	3
4.	201__OE54_	Open Elective I	3	0	0	3
5.	20154C55	Theory of Machines-II	3	2	0	4
PRACTICAL						
6.	20154L56	Theory of Machines Laboratory	0	0	3	2
7.	20154L57	Thermal Engineering Laboratory	0	0	3	2
8.	20154L58	Metrology and Measurements Laboratory	0	0	3	2
TOTAL			16	6	9	22

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

SEMESTER VI

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C61	Design of Transmission Systems	3	0	0	3
2.	20154C62	Computer Aided Design And Manufacturing	3	0	0	3
3.	20154C63	Heat and Mass Transfer	3	2	0	4
4.	20154C64	Finite Element Analysis	3	0	0	3
5.	20154C65	Hydraulics And Pneumatics	3	0	0	3
6.	20154E66_	Elective - I	3	0	0	3
PRACTICAL						
7.	20154L67	CAD / CAM Laboratory	0	0	3	2
8.	20154L68	Design and Fabrication Project	0	0	3	2
9.	20154L69	Professional Communication	0	0	2	1
TOTAL			18	2	8	24

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT ENT

SEMESTER VII

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C71	Power Plant Engineering	3	0	0	3
2.	20154C72	Process Planning and Cost Estimation	3	0	0	3
3.	20154C73	Mechatronics	3	0	0	3
4.	201__OE74_	Open ElectiveII	3	0	0	3
5.	20154E75_	Elective II	3	0	0	3
6.	20154E76_	Elective III	3	0	0	3
PRACTICAL						
7.	20154L77	Simulation and Analysis Laboratory	0	0	3	2
8.	20154L78	Mechatronics Laboratory	0	0	3	2
9.	20154L79	Technical Seminar	0	0	2	1
TOTAL			20	2	8	23

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

SEMESTER VIII

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154S81	Principles of Management	3	0	0	3
2.	20154E82_	Elective– IV	3	0	0	3
PRACTICAL						
3.	20154P83	Project Work	0	0	20	10
TOTAL			6	0	20	13

ENTREPRENEURSHIP

.ELECTIVE – I (VI SEMESTER)

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E66A	Automobile Engineering	3	0	0	3
2.	20154E66B	Artificial and Neural Network	3	0	0	3
3.	20154E66C	Refrigeration and Air Conditioning	3	0	0	3
4.	20154E66D	Machine Tool Design	3	0	0	3
5	2015E66E	Plant Layout and Material handling	3	0	0	3

EMPLOYABILITY

ELECTIVE – II (VII SEMESTER)

	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E75A	Computational Fluid Dynamics	3	0	0	3
2.	20154E75B	Jet propulsion and Rocket Engine	3	0	0	3
3.	20154E75C	Mechanical Vibration	3	0	0	3
4.	20154E75D	Total Quality Management	3	0	0	3
5	20154E75E	Solar Energy Technology	3	0	0	3

EMPLOYABILITY

ENTREPRENEURSHIP

ELECTIVE – III (VII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E76A	Robotics	3	0	0	3
2.	20154E76B	Industrial Management	3	0	0	3
3.	20154E76C	Production and Operation Management	3	0	0	3
4.	20154E76D	Tribology	3	0	0	3
5.	20154E75E	Maintenance and Safety Engineering	3	0	0	3

EMPLOYABILITY

ENTREPRENEURSHIP

ELECTIVE – IV (VIII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E82A	Production Planning and Control	3	0	0	3
2.	20154E82B	Electric and Hybrid Vehicle	3	0	0	3
3.	20154E82C	Disaster Management	3	0	0	3
4.	20154E82D	Nano Technology	3	0	0	3
5.	20154E82E	IC Engine and Gas Turbines	3	0	0	3

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

OPEN ELECTIVE– I

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	20150OE54A	Data Base management systems	3	0	0	3
2.		20150OE54B	Cloud computing	3	0	0	3
3.	ECE	20152OE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
4.		20152OE54B	Sensors And Transducers	3	0	0	3
5.	EEE	20153OE54A	Industrial Nano Technology	3	0	0	3
6.		20153OE54B	Energy Conservation and Management	3	0	0	3
7.	CIVIL	20155OE54A	Air Pollution And Control Engineering	3	0	0	3
8.		20155OE54B	Geographic Information Systems	3	0	0	3

OPEN ELECTIVE– II

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	20150OE74A	Introduction to C programming	3	0	0	3
2.		20150OE74B	Data structures and algorithms	3	0	0	3
3.	ECE	20152OE74A	Robotics	3	0	0	3
4.		20150OE74B	Electronic devices	3	0	0	3
5.	EEE	20153OE74A	Basic circuit theory	3	0	0	3
6.		20153OE74B	Introduction to renewable energy systems	3	0	0	3
7.	CIVIL	20155OE74A	Green building design	3	0	0	3
8.		20155OE74B	Waste water treatment	3	0	0	3

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

UNIT – I**Concept of Human Values, Value Education Towards Personal Development**

Aim of education and value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education.

Personal Development :

Self analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbours, co-workers.

Character Formation Towards Positive Personality:

Truthfulness, Constructivity, Sacrifice, Sincerity, Self Control, Altruism, Tolerance, Scientific Vision.

UNIT – II**Value Education Towards National and Global Development National and International Values:**

Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity.

Social Values - Pity and probity, self control, universal brotherhood.

Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Religious Values - Tolerance, wisdom, character.

Aesthetic values - Love and appreciation of literature and fine arts and respect for the same.

National Integration and international understanding.

UNIT – III Impact of Global Development on Ethics and Values

Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise.

Modern Challenges of Adolescent Emotions and behavior; Sex and spirituality: Comparison and competition; positive and negative thoughts.

Adolescent Emotions, arrogance, anger, sexual instability, selfishness, defiance.

UNIT - IV Therapeutic Measures

Control of the mind through

- Simplified physical exercise
- Meditation – Objectives, types, effect on body, mind and soul
- Yoga – Objectives, Types, Asanas

d. Activities:

- (i) Moralisation of Desires
- (ii) Neutralisation of Anger
- (iii) Eradication of Worries
- (iv) Benefits of Blessings

UNIT; V Human Rights

1. Concept of Human Rights – Indian and International Perspectives
 - a. Evolution of Human Rights
 - b. Definitions under Indian and International documents
2. Broad classification of Human Rights and Relevant Constitutional Provisions.
 - a. Right to Life, Liberty and Dignity
 - b. Right to Equality
 - c. Right against Exploitation
 - d. Cultural and Educational Rights
 - e. Economic Rights
 - f. Political Rights
 - g. Social Rights
3. Human Rights of Women and Children
 - a. Social Practice and Constitutional Safeguards
 - (i) Female Foeticide and Infanticide
 - (ii) Physical assault and harassment
 - (iii) Domestic violence
 - (iv) Conditions of Working Women
4. Institutions for Implementation
 - a. Human Rights Commission
 - b. Judiciary
5. Violations and Redressal
 - a. Violation by State
 - b. Violation by Individuals
 - c. Nuclear Weapons and terrorism
 - d. Safeguards.

UNIT-I: THE MAKING OF INDIAN CONSTITUTION

The Constituent Assembly: Organization- Character- Work-Salient feature of the constitution- Writtern and detailed constitution- Socialism- Secularism- Democracy and Republic.

UNIT-II: FUNDAMENTAL RIGHTS AND FUNDAMENTAL DUTIES OF THE CITIZENS

Right of equality- Right of freedom-Right against exploitation-Right to freedom of religion- Cultural and Educational rights-Right to constitutional remedies- Fundamental duties.

UNIT-III: DIRECTIVE PRINCIPLES OF STATE POLICY

Socialistic principles- Gandhian principles- Liberal and general principles-Differences between Fundamental Rights and Directive principles

UNIT-IV: THE UNION EXECUTIVE, UNION PARLIAMENT AND SUPREME COURT

Powers and Positions of the president- Qualification-Method of election of president and Vice President- Prime minister- Rajya sabha- Lok sabha- The Supreme Court- High Court- Functions and Positions of Supreme Court and High Court.

UNIT V: STATE COUNCIL- ELECTION SYSTEM AND PARLIMENTARY DEMOCRACY IN INDIA

State Council of Ministers- Chief Minister- Election Systems in India- Main Features-Election Commission – Features of Indian Democracy.

REFERENCES:

1. Palekar. S.A., Indian constitution government and politics, ABD Publications , India
2. Aiyer, Alladi Krishnaswami, Constitution and Fundamental rights 1955
3. Markandan. K.C., Directive Principles in the Indian Constitution 1966.
4. Kashyap, Subash C., Our Parliament , National Book Trust , New Delhi 1989.

20154L39

INTERPERSONAL SKILLS/LISTENING & SPEAKING

L T P C

0 0 2 1

OBJECTIVES: The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

UNIT I

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL : 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.

2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
1. ” Tata McGraw-Hill Publishers, 2007

OBJECTIVE:

- To Study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real life manufacture of components in the industry

LIST OF EXPERIMENTS:

- Contour milling using vertical milling machine
- Spur gear cutting in milling machine
-
- Helical Gear Cutting in milling machine
- Gear generation in hobbing machine
- Gear generation in gear shaping machine
- Plain Surface grinding
- Cylindrical grinding
- Tool angle grinding with tool and Cutter Grinder
- Measurement of cutting forces in Milling / Turning Process
- CNC Part Programming

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 use different machine tools to manufacturing gears
 CO2 Ability to use different machine tools to manufacturing gears.
 CO3 Ability to use different machine tools for finishing operations
 CO4 Ability to manufacture tools using cutter grinder
 CO5 Develop CNC part programming

TOTAL: 45

PERIODS LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Turret and Capstan Lathes	1 No each
2	Horizontal Milling Machine	2 No
3	Vertical Milling Machine	1 No
4	Surface Grinding Machine	1 No.
5	Cylindrical Grinding Machine	1 No.
6	Radial Drilling Machine	1 No.
7	lathe Tool Dynamometer	1 No
8	Milling Tool Dynamometer	1 No
9	Gear Hobbing Machine	1 No
10	Tool Makers Microscope	1 No
11	CNC Lathe	1 No
12	CNC Milling machine	1 No
13	Gear Shaping machine	1 No
14	Centerless grinding machine	1 No
15	Tool and cutter grinder	1 No

OBJECTIVES:

- To study the mechanical properties of materials when subjected to different types of loading.
- To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

STRENGTH OF MATERIALS**23****LIST OF EXPERIMENTS**

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison
 - (i) Unhardened specimen
 - (ii) Quenched Specimen and
 - (iii) Quenched and tempered specimen.
11. Microscopic Examination of
 - (i) Hardened samples and
 - (ii) Hardened and tempered samples.

OUTCOME:

- Ability to perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity	1
2	Torsion Testing Machine (60 NM Capacity)	1
3	Impact Testing Machine (300 J Capacity)	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads (2500 N)	1
7	Metallurgical Microscopes	3
8	Muffle Furnace (800 C)	1

FLUID MECHANICS AND MACHINES LABORATORY**22****LIST OF EXPERIMENTS**

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.

7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to:

- Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
- Use the measurement equipments for flow measurement.
- Perform test on different fluid machinery.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. NO.	NAME OF THE EQUIPMENT	Qty.
1	Orifice meter setup	1
2	Venturi meter setup	1
3	Rotameter setup	1
4	Pipe Flow analysis setup	1
5	Centrifugal pump/submersible pump setup	1
6	Reciprocating pump setup	1
7	Gear pump setup	1
8	Pelton wheel setup	1
9	Francis turbine setup	1
10	Kaplan turbine setup	1

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

UNIT II

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-Writing- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV

Reading- Genre and Organization of Ideas- Writing- Email writing- resumes – Job application- project writing-writing convincing proposals.

UNIT V

Reading- Critical reading and thinking- understanding how the text positions the reader- identify Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:

- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011
2. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011

REFERENCES

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004

OBJECTIVES

- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components
- (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS**9+6**

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – curved beams – crane hook and ‘C’ frame- Factor of safety - theories of failure – Design based on strength and stiffness – stress concentration – Design for variable loading.

UNIT II SHAFTS AND COUPLINGS**9+6**

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS**9+6**

Threaded fasteners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS**9+6**

Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS**9+6**

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45+30= 75 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Explain the influence of steady and variable stresses in machine component design.
- CO2 Apply the concepts of design to shafts, keys and couplings.
- CO3 Apply the concepts of design to temporary and permanent joints.
- CO4 Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.
- CO5 Apply the concepts of design to bearings.

TEXT BOOKS:

1. Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 9th Edition, Tata McGraw-Hill, 2011.

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010
2. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
3. P.C. Gope, "Machine Design – Fundamental and Application", PHI learning private ltd, New Delhi, 2012.
4. R.B. Patel, "Design of Machine Elements", MacMillan Publishers India P Ltd., Tech-Max Educational resources, 2011.
5. Robert C. Juvinall and Kurt M Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
6. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2015.

20154C53

METROLOGY AND MEASUREMENTS

L	T	P	C
4	0	0	4

OBJECTIVES:

- To provide knowledge on various Metrological equipments available to measure the dimension of the components.
- To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I BASICS OF METROLOGY**12**

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards.

UNIT II LINEAR AND ANGULAR MEASUREMENTS**12**

Linear Measuring Instruments – Evolution – Types – Classification – Limit gauges – gauge design – terminology – procedure – concepts of interchange ability and selective assembly – Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

UNIT III ADVANCES IN METROLOGY**12**

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of CMM – Types of CMM

– Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

UNIT IV FORM MEASUREMENT**12**

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE**12**

Force, torque, power - mechanical , Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability.

TOTAL : 60 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Describe the concepts of measurements to apply in various metrological instruments
- CO2 Outline the principles of linear and angular measurement tools used for industrial Applications
- CO3 Explain the procedure for conducting computer aided inspection
- CO4 Demonstrate the techniques of form measurement used for industrial components
- CO5 Discuss various measuring techniques of mechanical properties in industrial applications

TEXT BOOKS:

1. Gupta. I.C., “Engineering Metrology”, Dhanpatrai Publications, 2005.
2. Jain R.K. “Engineering Metrology”, Khanna Publishers, 2009.

REFERENCES:

1. Alan S. Morris, “The essence of Measurement”, Prentice Hall of India 1996.
2. Beckwith, Marangoni, Lienhard, “Mechanical Measurements”, Pearson Education , 2014.
3. Charles Reginald Shotbolt, “Metrology for Engineers”, 5th edition, Cengage Learning EMEA, 1990.
4. Donald Peckman, “Industrial Instrumentation”, Wiley Eastern, 2004.
5. Raghavendra ,Krishnamurthy “Engineering Metrology & Measurements”, Oxford Univ. Press, 2013.

OBJECTIVES:

- To study the valve timing-V diagram and performance of IC Engines
- To Study the characteristics of fuels/Lubricates used in IC Engines
- To study the Performance of steam generator/ turbine
- To study the heat transfer phenomena predict the relevant coefficient using implementation
- To study the performance of refrigeration cycle / components

LIST OF EXPERIMENTS**I.C. ENGINE LAB**

1. Valve Timing and Port Timing diagrams.
2. Actual p-v diagrams of IC engines.
3. Performance Test on 4 – stroke Diesel Engine.
4. Heat Balance Test on 4 – stroke Diesel Engine.
5. Morse Test on Multi-cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants.

STEAM LAB

1. Study on Steam Generators and Turbines.
2. Performance and Energy Balance Test on a Steam Generator.
3. Performance and Energy Balance Test on Steam Turbine.

HEAT TRANSFER LAB:

1. Thermal conductivity measurement using guarded plate apparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Determination of Thermal conductivity of composite wall.
6. Determination of Thermal conductivity of insulating powder.
7. Heat transfer from pin-fin apparatus (natural & forced convection modes)
8. Determination of Stefan – Boltzmann constant.
9. Determination of emissivity of a grey surface.
10. Effectiveness of Parallel / counter flow heat exchanger.

REFRIGERATION AND AIR CONDITIONING LAB

1. Determination of COP of a refrigeration system
2. Experiments on Psychrometric processes
3. Performance test on a reciprocating air compressor
4. Performance test in a HC Refrigeration System
5. Performance test in a fluidized Bed Cooling Tower

TOTAL: 45 PERIODS**OUTCOMES:****Upon the completion of this course the students will be able to**

- CO1 conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials.
- CO2 conduct tests on natural and forced convective heat transfer apparatus and evaluate heat transfer coefficient.

- CO3 conduct tests on radiative heat transfer apparatus and evaluate Stefan Boltzmann constant and emissivity.
- CO4 conduct tests to evaluate the performance of parallel/counter flow heat exchanger apparatus and reciprocating air compressor.
- CO5 conduct tests to evaluate the performance of refrigeration and airconditioning test rigs.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

	NAME OF THE EQUIPMENT	Qty.
1	I.C Engine – 2 stroke and 4 stroke model	1 set
2	Apparatus for Flash and Fire Point	1 No.
3	4-stroke Diesel Engine with mechanical loading.	1 No
4	4-stroke Diesel Engine with hydraulic loading.	1 No.
5	4-stroke Diesel Engine with electrical loading.	1 No.
6	Multi-cylinder Petrol Engine	1 No.
7	Single cylinder Petrol Engine	1 No.
8	Data Acquisition system with any one of the above engines	1 No.
9	Steam Boiler with turbine setup	1 No.

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Guarded plate apparatus	1 No.
2	Lagged pipe apparatus	1 No.
3	Natural convection-vertical cylinder apparatus	1 No.
4	Forced convection inside tube apparatus	1 No.
5	Composite wall apparatus	1 No.
6	Thermal conductivity of insulating powder apparatus	1 No.
7	Pin-fin apparatus	1 No.
8	Stefan-Boltzmann apparatus	1 No.
9	Emissivity measurement apparatus	1 No.
10	Parallel/counter flow heat exchanger apparatus	1 No.
11	Single/two stage reciprocating air compressor	1 No.
12	Refrigeration test rig	1 No.
13	Air-conditioning test rig	1 No.

OBJECTIVE:

- To familiar with different measurement equipments and use of this industry for quality inspection.

LIST OF EXPERIMENTS

- Calibration and use of measuring instruments – Vernier caliper, micrometer, Vernier height gauge – using gauge blocks
- Calibration and use of measuring instruments – depth micrometer, bore gauge, telescopic gauge
- Measurement of linear dimensions using Comparators
- Measurement of angles using bevel protractor and sine bar
- Measurement of screw thread parameters – Screw thread Micrometers and Three wire method (floating carriage micrometer)
- Measurement of gear parameters – disc micrometers, gear tooth vernier caliper
- Measurement of features in a prismatic component using Coordinate Measuring Machine (CMM)
- Programming of CNC Coordinate Measuring Machines for repeated measurements of identical components
- Non-contact (Optical) measurement using Toolmaker's microscope / Profile projector and Video measurement system
- Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments.
- Machine tool metrology – Level tests using precision level; Testing of straightness of a machine tool guide way using Autocollimator, spindle tests.
- Measurement of force, torque and temperature

TOTAL: 45 PERIODS**OUTCOMES****Upon the completion of this course the students will be able to**

- CO1 Measure the gear tooth dimensions, angle using sine bar, straightness and flatness, thread parameters, temperature using thermocouple, force, displacement, torque and vibration.
- CO2 Calibrate the vernier, micrometer and slip gauges and setting up the comparator for the inspection.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Micrometer	5
2	Vernier Caliper	5
3	Vernier Height Gauge	2
4	Vernier depth Gauge	2
5	Slip Gauge Set	1
6	Gear Tooth Vernier	1
7	Sine Bar	1
8	Floating Carriage Micrometer	1
9	Profile Projector / Tool Makers Microscope	1
10	Parallel / counter flow heat exchanger apparatus	1
11	Mechanical / Electrical / Pneumatic Comparator	1
12	Autocollimator	1
13	Temperature Measuring Setup	1

14	Force Measuring Setup	1
15	Torque Measuring Setup	1
16	Coordinate measuring machine	1
17	Surface finish measuring equipment	1
18	Bore gauge	1
19	Telescope gauge	1

OBJECTIVES:

- To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues (Use of P S G Design Data Book permitted)

UNIT I DESIGN OF FLEXIBLE ELEMENTS**9+6**

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS**9+6**

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane-Equivalent number of teeth-forces for helical gears.

UNIT III BEVEL, WORM AND CROSS HELICAL GEARS**9+6**

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits-terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT IV GEAR BOXES**9+6**

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

UNIT V CAMS, CLUTCHES AND BRAKES**9+6**

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

TOTAL : 45+30=75 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 apply the concepts of design to belts, chains and rope drives.
 CO2 apply the concepts of design to spur, helical gears.
 CO3 apply the concepts of design to worm and bevel gears.
 CO4 apply the concepts of design to gear boxes .
 CO5 apply the concepts of design to cams, brakes and clutches

TEXT BOOKS:

1. Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.

2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008.

REFERENCES:

1. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8th Edition, Printice Hall, 2003.
2. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
3. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000.
4. Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine Design”, 4th Edition, Wiley, 2005
5. Sundararajamoorthy T. V, Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003.

OBJECTIVES:

- To provide an overview of how computers are being used in mechanical component design
- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT I INTRODUCTION**9+6**

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation-Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – CAD/CAM concepts —Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance

UNIT II GEOMETRIC MODELING**9+6**

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep

UNIT III CAD STANDARDS**9+6**

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

UNIT IV FUNDAMENTAL OF CNC AND PART PROGRAMING**9+6**

Introduction to NC systems and CNC - Machine axis and Co-ordinate system- CNC machine tools- Principle of operation CNC- Construction features including structure- Drives and CNC controllers- 2D and 3D machining on CNC- Introduction of Part Programming, types - Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAM package.

UNIT V CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS)**9+6**

Group Technology(GT),Part Families–Parts Classification and coding–Simple Problems in Opitz Part Coding system–Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS

TOTAL : 45+30=75 PERIODS**OUTCOMES:****Upon the completion of this course the students will be able to**

- | | |
|-----|---|
| CO1 | Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics |
| CO2 | Explain the fundamentals of parametric curves, surfaces and Solids |
| CO3 | Summarize the different types of Standard systems used in CAD |
| CO4 | Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines |
| CO5 | Summarize the different types of techniques used in Cellular Manufacturing and FMS |

TEXT BOOKS:

37

1. Ibrahim Zeid “Mastering CAD CAM” Tata McGraw-Hill PublishingCo.2007
2. Mikell.P.Groover “Automation, Production Systems and Computer Integrated Manufacturing”, Prentice Hall of India, 2008.
3. Radhakrishnan P, SubramanyanS.andRaju V., “CAD/CAM/CIM”, 2nd Edition, New Age International (P) Ltd, New Delhi,2000.

REFERENCES:

1. Chris McMahon and Jimmie Browne “CAD/CAM Principles", "Practice and Manufacturing management “ Second Edition, Pearson Education, 1999.
2. Donald Hearn and M. Pauline Baker “Computer Graphics”. Prentice Hall, Inc,1992.
3. Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education -2003
4. William M Neumann and Robert F.Sproul “Principles of Computer Graphics”, McGraw Hill Book Co. Singapore, 1989.

OBJECTIVES:

- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I INTRODUCTION 9+6

Historical Background – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II ONE-DIMENSIONAL PROBLEMS 9+6

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices - Solution of problems from solid mechanics and heat transfer. Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation – Transverse deflections and Natural frequencies of beams.

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS 9+6

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation – Finite Element formulation – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non circular shafts – Quadrilateral elements – Higher Order Elements.

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS 9+6

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION 9+6

Natural co-ordinate systems – Isoparametric elements – Shape functions for iso parametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress problems - Matrix solution techniques – Solutions Techniques to Dynamic problems – Introduction to Analysis Software.

TOTAL : 45+30=75 PERIODS**OUTCOMES**

- CO1 Summarize the basics of finite element formulation.
- CO2 Apply finite element formulations to solve one dimensional Problems.
- CO3 Apply finite element formulations to solve two dimensional scalar Problems.
- CO4 Apply finite element method to solve two dimensional Vector problems.
- CO5 Apply finite element method to solve problems on iso parametric element and dynamic Problems.

TEXT BOOKS:

1. Reddy. J.N., “An Introduction to the Finite Element Method”, 3rd Edition, Tata McGraw-Hill, 2005
2. Seshu, P, “Text Book of Finite Element Analysis”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

REFERENCES:

1. Bhatti Asghar M, "Fundamental Finite Element Analysis and Applications", John Wiley & Sons, 2005 (Indian Reprint 2013)*
2. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", 3rd Edition, Prentice Hall College Div, 1990
3. Logan, D.L., "A first course in Finite Element Method", Thomson Asia Pvt. Ltd., 2002
4. Rao, S.S., "The Finite Element Method in Engineering", 3rd Edition, Butterworth Heinemann, 2004
5. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2002.

OBJECTIVES:

- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS 9

Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids and selection – Basics of Hydraulics – Pascal’s Law – Principles of flow - Friction loss – Work, Power and Torque Problems, Sources of Hydraulic power : Pumping Theory – Pump Classification – Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criteria of Linear and Rotary – Fixed and Variable displacement pumps – Problems.

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS 9

Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning – Hydraulic motors - Control Components : Direction Control, Flow control and pressure control valves – Types, Construction and Operation – Servo and Proportional valves – Applications – Accessories : Reservoirs, Pressure Switches – Applications – Fluid Power ANSI Symbols – Problems.

UNIT III HYDRAULIC CIRCUITS AND SYSTEMS 9

Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical hydraulic servo systems.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS 9

Properties of air – Perfect Gas Laws – Compressor – Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit – Cascade method – Electro Pneumatic System – Elements – Ladder diagram – Problems, Introduction to fluidics and pneumatic logic circuits.

UNIT V TROUBLE SHOOTING AND APPLICATIONS

9

Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and Forklift applications. Design of Pneumatic circuits for Pick and Place applications and tool handling in CNC Machine tools – Low cost Automation – Hydraulic and Pneumatic power packs.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Explain the Fluid power and operation of different types of pumps.
- CO2 Summarize the features and functions of Hydraulic motors, actuators and Flow control valves
- CO3 Explain the different types of Hydraulic circuits and systems
- CO4 Explain the working of different pneumatic circuits and systems
- CO5 Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.

TEXT BOOKS:

1. Anthony Esposito, “Fluid Power with Applications”, Pearson Education 2005.
2. Majumdar S.R., “Oil Hydraulics Systems- Principles and Maintenance”, Tata McGraw-Hill, 2001.

REFERENCES:

1. Anthony Lal, “Oil hydraulics in the service of industry”, Allied publishers, 1982.
2. Dudelyt, A. Pease and John T. Pippenger, “Basic Fluid Power”, Prentice Hall, 1987.
3. Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw Hill, 1995
4. Michael J, Prinches and Ashby J. G, “Power Hydraulics”, Prentice Hall, 1989.
5. Shanmugasundaram.K, “Hydraulic and Pneumatic controls”, Chand & Co, 2006.

OBJECTIVES:

- To gain practical experience in handling 2D drafting and 3D modelling software systems.
- To study the features of CNC Machine Tool.
- To expose students to modern control systems (Fanuc, Siemens etc.,)
- To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

LIST OF EXPERIMENTS**1. 3D GEOMETRIC MODELLING****23 PERIODS****List of Experiments**

1. Introduction of 3D Modelling software

Creation of 3D assembly model of following machine elements using 3D Modelling software

2. Flange Coupling
3. Plummer Block
4. Screw Jack
5. Lathe Tailstock
6. Universal Joint
7. Machine Vice
8. Stuffing box
9. Crosshead
10. Safety Valves
11. Non-return valves
12. Connecting rod
13. Piston
14. Crankshaft

* Students may also be trained in manual drawing of some of the above components

2. Manual Part Programming.**22 PERIODS**

- (i) Part Programming - CNC Machining Centre
 - a) Linear Cutting.
 - b) Circular cutting.
 - c) Cutter Radius Compensation.
 - d) Canned Cycle Operations.
- (ii) Part Programming - CNC Turning Centre
 - a) Straight, Taper and Radius Turning.
 - b) Thread Cutting.
 - c) Rough and Finish Turning Cycle.
 - d) Drilling and Tapping Cycle.

3. Computer Aided Part Programming

- e) CL Data and Post process generation using CAM packages.
- f) Application of CAPP in Machining and Turning Centre.

TOTAL: 45 PERIODS**OUTCOMES**

43

- CO1 Draw 3D and Assembly drawing using CAD software
 CO2 Demonstrate manual part programming with G and M codes using CAM

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Qty
HARDWARE		
1.	Computer Server	1
2.	Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server	30
3.	A3 size plotter	1
4.	Laser Printer	1
5.	CNC Lathe	1
6.	CNC milling machine	1
SOFTWARE		
7.	Any High end integrated modeling and manufacturing CAD / CAM software	15 licenses
8.	CAM Software for machining centre and turning centre (CNC Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)	15 licenses
9.	Licensed operating system	Adequate
10.	Support for CAPP	Adequate

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DESIGN AND FABRICATION PROJECT

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OBJECTIVE:

- The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION

The students may be grouped into 2 to 4 and work under a project supervisor. The device/system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 design and Fabricate the machine element or the mechanical product.

CO2 demonstrate the working model of the machine element or the mechanical product.

OBJECTIVES: The course aims to:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes

TOTAL : 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. Globearena
2. Win English

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 15

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 15

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 15

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor (BWR)*, *Pressurized Water Reactor (PWR)*, *CANada Deuterium- Uranium reactor (CANDU)*, Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 15

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic (SPV)*, Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 15

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL : 60 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

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PROCESS PLANNING AND COST ESTIMATION

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OBJECTIVE:

- To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I INTRODUCTION TO PROCESS PLANNING

9+6

Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II PROCESS PLANNING ACTIVITIES

9+6

Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III INTRODUCTION TO COST ESTIMATION

9+6

Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost

UNIT IV PRODUCTION COST ESTIMATION

9+6

Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V MACHINING TIME CALCULATION

9+6

Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding.

TOTAL: 45+30=75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 select the process, equipment and tools for various industrial products.
- CO2 prepare process planning activity chart.
- CO3 explain the concept of cost estimation.
- CO4 compute the job order cost for different type of shop floor.
- CO5 calculate the machining time for various machining operations.

TEXT BOOKS:

1. Peter scalon, “Process planning, Design/Manufacture Interface”, Elsevier science technology Books, Dec 2002.
2. Sinha B.P, “Mechanical Estimating and Costing”, Tata-McGraw Hill publishing co, 1995.

REFERENCES:

1. Chitale A.V. and Gupta R.C., “Product Design and Manufacturing”, 2nd Edition, PHI, 2002.
2. Ostwalal P.F. and Munez J., “Manufacturing Processes and systems”, 9th Edition, John Wiley, 1998.
3. Russell R.S and Tailor B.W, “Operations Management”, 4th Edition, PHI, 2003.
4. Mikell P. Groover, “Automation, Production, Systems and Computer Integrated Manufacturing”, Pearson Education 2001.
5. K.C. Jain & L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers 1990.

20154C73

MECHATRONICS

L T P C

4 0 0 4

OBJECTIVE:

- To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I INTRODUCTION 12

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors

UNIT II MICROPROCESSOR AND MICROCONTROLLER 9+6

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram,.

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE 9+6

Introduction – Architecture of 8255, Keyboard interfacing, LED display –interfacing, ADC and DAC interface, Temperature Control – Stepper Motor Control – Traffic Control interface.

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 9+6

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.

UNIT V ACTUATORS AND MECHATRONIC SYSTEM DESIGN 9+6

Types of Stepper and Servo motors – Construction – Working Principle – Advantages and Disadvantages. Design process-stages of design process – Traditional and Mechatronics design concepts – Case studies of Mechatronics systems – Pick and place Robot – Engine Management system – Automatic car park barrier.

TOTAL : 45+30=75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.
- CO2 Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.
- CO3 Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device Interfacing
- CO4 Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.
- CO5 Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies

TEXT BOOKS:

- Bolton, “Mechatronics”, Prentice Hall, 2008
- Ramesh S Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Prentice Hall, 2008.

REFERENCES:

1. Bradley D.A, Dawson D, Buru N.C and Loader A.J, "Mechatronics", Chapman and Hall, 1993.
2. Clarence W, de Silva, "Mechatronics" CRC Press, First Indian Re-print, 2013
3. Devadas Shetty and Richard A. Kolk, "Mechatronics Systems Design", PWS publishing company, 2007.
4. Krishna Kant, "Microprocessors & Microcontrollers", Prentice Hall of India, 2007.
5. Michael B.Histand and Davis G.Alciatore, "Introduction to Mechatronics and Measurement systems", McGraw Hill International edition, 2007.

20154L77

**SIMULATION AND ANALYSIS
LABORATORY**

L T P C
0 0 3 2

OBJECTIVES:

- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

LIST OF EXPERIMENTS A. SIMULATION

1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration
3. Mechanism Simulation using Multibody Dynamic software

B. ANALYSIS

1. Force and Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
4. Stress analysis of axi – symmetric components.
5. Thermal stress and heat transfer analysis of plates.
6. Thermal stress analysis of cylindrical shells.
7. Vibration analysis of spring-mass systems.
8. Model analysis of Beams.
9. Harmonic, transient and spectrum analysis of simple systems.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB.
- CO2 analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems.
- CO3 calculate the natural frequency and mode shape analysis of 2D components and beams.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. NO.	NAME OF THE EQUIPMENT	Qty.
1	Computer Work Station	15
2	Color Desk Jet Printer	01
3	Multibody Dynamic Software Suitable for Mechanism simulation and analysis	15 licenses
4	C / MATLAB	5 licenses

OBJECTIVE:

- To know the method of programming the microprocessor and also the design, modeling & analysis of basic electrical, hydraulic & pneumatic Systems which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS:

- Assembly language programming of 8085 – Addition – Subtraction – Multiplication – Division – Sorting – Code Conversion.
- Stepper motor interface.
- Traffic light interface.
- Speed control of DC motor.
- Study of various types of transducers.
- Study of hydraulic, pneumatic and electro-pneumatic circuits.
- Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using Software.
- Study of PLC and its applications.
- Study of image processing technique.

TOTAL: 45 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
- CO2 Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	NAME OF THE EQUIPMENT	Qty.
1	Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each	1 No.
2	Basic Hydraulic Trainer Kit	1 No
3	Hydraulics and Pneumatics Systems Simulation Software	10 No
4	8051 - Microcontroller kit with stepper motor and drive circuit sets	2 No
5	Image processing system with hardware & software	1 No.

20154L79

TECHNICALSEMINAR

L T P C

0 0 2 1

To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

TOTAL: 30 PERIODS

OBJECTIVE:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS**OUTCOME:**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

- JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
- Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., Edition, 10th 2009.

REFERENCES:

- Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
- Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.

3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999
- 5.

ELECTIVE – I (VI SEMESTER)

20154E66A	AUTOMOBILE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I VEHICLE STRUCTURE AND ENGINES 9

Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions and materials, variable valve timing (VVT).

UNIT II ENGINE AUXILIARY SYSTEMS 9

Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS 9

Steering geometry and types of steering gear box- Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 recognize the various parts of the automobile and their functions and materials.
- CO2 discuss the engine auxiliary systems and engine emission control.
- CO3 distinguish the working of different types of transmission systems.
- CO4 explain the Steering, Brakes and Suspension Systems.
- CO5 predict possible alternate sources of energy for IC Engines.

TEXT BOOKS:

1. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002.
2. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 13th Edition 2014..

REFERENCES:

1. Ganesan V. “Internal Combustion Engines”, Third Edition, Tata McGraw-Hill, 2012.
2. Heinz Heisler, “Advanced Engine Technology,” SAE International Publications USA, 1998.
3. Joseph Heitner, “Automotive Mechanics,” Second Edition, East-West Press, 1999.
4. Martin W, Stockel and Martin T Stockle , “Automotive Mechanics Fundamentals,” The Good heart - Will Cox Company Inc, USA ,1978.
5. Newton ,Steeds and Garet, “Motor Vehicles”, Butterworth Publishers,1989.

OBJECTIVE

To promote safety in engineering industries for educating the employees and enforcing various labour legislation in order to eliminate the prevailing unsafe condition and correct the usage actions.

UNIT – I PRINCIPLES OF ACCIDENT PREVENTION**9**

Accident Prevention – Causes and Cost of Accident – Laws and regulations – Indian Factories Act governing health and safety of workers.

UNIT – II MACHINE GUARDING**9**

Machine guarding – need, basic requirements and benefits of machine guarding – types of guarding with applications.

UNIT – III**ELECTRICAL SAFETY**

Electrical hazards – Shock protections methods – permit to work on electrical lines / installations – use of personal protective equipments.

UNIT – IV**SAFETY IN MATERIAL HANDLING**

Material handling – manual and mechanical – material handling equipments – safe use and legal aspects.

UNIT – V**FIRE SAFETY**

Fire – Extinguishing fire – Classification of fire – Types of fire extinguishers – Applications – Causes of fire.

REFERENCE:

- 1) National Safety council manual, Bombay
- 2) Factories Act 1948
- 3) Electrical Hazards – B. R. Kamath
- 4) Safety in the use of electricity, NSC, Bombay.

OBJECTIVES:

- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.
(Use of Standard Gas Tables permitted)

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS**9**

Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers

UNIT II FLOW THROUGH DUCTS**9**

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties.

UNIT III NORMAL AND OBLIQUE SHOCKS**9**

Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Applications.

UNIT IV JET PROPULSION**9**

Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operating principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION**9**

Types of rocket engines – Propellants-feeding systems – Ignition and combustion – Theory of rocket propulsion – Performance study – Staging – Terminal and characteristic velocity – Applications – space flights.

TOTAL: 45 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Apply the concept of compressible flows in variable area ducts.
- CO2 Apply the concept of compressible flows in constant area ducts.
- CO3 examine the effect of compression and expansion waves in compressible flow.
- CO4 use the concept of gas dynamics in Jet Propulsion.
- CO5 apply the concept of gas dynamics in Space Propulsion.

TEXT BOOKS:

1. Anderson, J.D., "Modern Compressible flow", 3rd Edition, McGraw Hill, 2012.
2. Yahya, S.M. "Fundamentals of Compressible Flow", New Age International (P) Limited, New Delhi, 2002.

REFERENCES:

1. Cohen. H., G.E.C. Rogers and Saravanamutto, "Gas Turbine Theory", Longman Group Ltd.,1980
2. Ganesan. V., "Gas Turbines", Tata McGraw Hill Publishing Co., New Delhi, 2010.
3. Shapiro. A.H., "Dynamics and Thermodynamics of Compressible fluid Flow", John wiley, New York, 1953.
4. Sutton. G.P., "Rocket Propulsion Elements", John wiley, New York,2010,.
5. Zucrow. N.J., "Principles of Jet Propulsion and Gas Turbines", John Wiley, New York, 1970.

OBJECTIVE:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION**8**

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms- multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION**9**

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS**12**

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂,MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES**9**

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS**7**

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS**OUTCOMES:**

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Characterization of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

20154E74A

RENEWABLE SOURCES OF ENERGY

L T P C
3 0 0 3

OBJECTIVE:

- At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I INTRODUCTION

9

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamil nadu, India and around the World – Potentials - Achievements / Applications – Economics of renewable energy systems.

UNIT II SOLAR ENERGY

9

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

UNIT III WIND ENERGY

9

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects

UNIT IV BIO - ENERGY

9

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications

UNIT V OTHER RENEWABLE ENERGY SOURCES

9

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Discuss the importance and Economics of renewable Energy
- CO2 Discuss the method of power generation from Solar Energy
- CO3 Discuss the method of power generation from Wind Energy
- CO4 Explain the method of power generation from Bio Energy
- CO5 Explain the Tidal energy, Wave Energy, OTEC, Hydro energy, Geothermal Energy, Fuel Cells and Hybrid Systems.

TEXT BOOKS:

1. Rai. G.D., "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
2. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.

REFERENCES:

1. Chetan Singh Solanki, Solar Photovoltaics, "Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2015.
2. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA 2017
3. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.
4. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012.
5. Johnson Gary, L. "Wind Energy Systems", Prentice Hall, New York, 1985

20154E74B

**NON CONVENTIONAL MACHINING
PROCESSES**

L T P C
3 0 0 3

OBJECTIVE:

- To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9

Unconventional machining Process – Need – classification – merits, demerits and applications. Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications.

UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES 9

Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing — Applications. Laser Beam machining and drilling, (LBM), plasma, Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 9

Chemical machining and Electro-Chemical machining (CHM and ECM)- Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters-ECG and ECH - Applications.

UNIT IV ADVANCED NANO FINISHING PROCESSES 9

Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9

Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Explain the need for unconventional machining processes and its classification
- CO2 Compare various thermal energy and electrical energy based unconventional machining processes.
- CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes.
- CO4 Explain various nano abrasives based unconventional machining processes.
- CO5 Distinguish various recent trends based unconventional machining processes.

TEXT BOOKS:

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi, 2007
2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi, 2007.

REFERENCES:

1. Benedict. G.F. “Nontraditional Manufacturing Processes”, Marcel Dekker Inc., New York, 1987.
2. Mc Geough, “Advanced Methods of Machining”, Chapman and Hall, London, 1998.
3. Paul De Garmo, J.T.Black, and Ronald. A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi , 2001.

OBJECTIVE:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS**15**

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS**8**

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS**6**

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS**6**

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS**10**

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOME:**

- Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

- Hillier and Libebberman, “Operations Research”, Holden Day, 2005
- Taha H.A., “Operations Research”, Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

- Bazara M.J., Jarvis and Sherali H., “Linear Programming and Network Flows”, John Wiley, 2009.
- Budnick F.S., “Principles of Operations Research for Management”, Richard D Irwin, 1990.
- Philip D.T. and Ravindran A., “Operations Research”, John Wiley, 1992.
- Shennoy G.V. and Srivastava U.K., “Operation Research for Management”, Wiley Eastern, 1994.
- Tulsian and Pasdey V., “Quantitative Techniques”, Pearson Asia, 2002.

OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES

9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I

9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM

9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM:**

Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO 9001-2015 standards

OBJECTIVES:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT 9

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 9

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data-Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 9

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 9

RGV, AGV; Implementation of Robots in Industries-Variou Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- CO1 Explain the concepts of industrial robots, classification, specifications and coordinate systems. Also summarize the need and application of robots in different sectors.
- CO2 Illustrate the different types of robot drive systems as well as robot end effectors.
- CO3 Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
- CO4 Develop robotic programs for different tasks and familiarize with the kinematics motions of robot.
- CO5 Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.

TEXT BOOKS:

1. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2012.
2. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach",Prentice Hall, 2003.

REFERENCES:

1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
2. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 2013.
3. Fu.K.S.,Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
4. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
5. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.

OBJECTIVES:

- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES: 9

Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – Locating methods and devices – Redundant Location – Principles of clamping – Mechanical actuation – pneumatic and hydraulic actuation Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

UNIT II JIGS AND FIXTURES 9

Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 9

Press Working Terminologies - operations – Types of presses – press accessories – Computation of press capacity – Strip layout – Material Utilization – Shearing action – Clearances – Press Work Materials – Center of pressure- Design of various elements of dies – Die Block – Punch holder, Die set, guide plates – Stops – Strippers – Pilots – Selection of Standard parts – Design and preparation of four standard views of simple blanking, piercing, compound and progressive dies.

UNIT IV BENDING AND DRAWING DIES 9

Difference between bending and drawing – Blank development for above operations – Types of Bending dies – Press capacity – Spring back – knockouts – direct and indirect – pressure pads – Ejectors – Variables affecting Metal flow in drawing operations – draw die inserts – draw beads- ironing – Design and development of bending, forming, drawing, reverse redrawing and combination dies – Blank development for axisymmetric, rectangular and elliptic parts – Single and double action dies.

UNIT V FORMING TECHNIQUES AND EVALUATION 9

Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:

Upon the completion of this course the students will be able to

- CO1 Summarize the different methods of Locating Jigs and Fixtures and Clamping principles
- CO2 Design and develop jigs and fixtures for given component
- CO3 Discuss the press working terminologies and elements of cutting dies
- CO4 Distinguish between Bending and Drawing dies.
- CO5 Discuss the different types of forming techniques

TEXT BOOKS:

1. Joshi, P.H. “Jigs and Fixtures”, Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2010.
2. Joshi P.H “Press tools - Design and Construction”, wheels publishing, 1996

REFERENCES:

1. ASTME Fundamentals of Tool Design Prentice Hall of India.
2. Design Data Hand Book, PSG College of Technology, Coimbatore.
3. Donaldson, Lecain and Goold “Tool Design”, 5th Edition, Tata McGraw Hill, 2017.
4. Hoffman “Jigs and Fixture Design”, Thomson Delmar Learning, Singapore, 2004.
5. Kempster, “Jigs and Fixture Design”, Third Edition, Hoddes and Stoughton, 1974.
6. Venkataraman. K., “Design of Jigs Fixtures & Press Tools”, Tata McGraw Hill, New Delhi, 2005.

UNIT 1: ENERGY SCENARIO

Introduction -Primary and Secondary Energy -Commercial Energy and Non commercial Energy-Renewable and Non Renewable Energy-Indian Energy Scenario-Energy Needs of Growing Economy-Long Term Energy Scenario for India-Energy Pricing in India-Energy Sector Reforms-Energy and Environment-Energy Security-Energy Conservation and its Importance-Energy Strategy for the Future.

UNIT II BASICS OF ENERGY AND ENERGY MANAGEMENT

Basics of energy: Definition-VariouS Forms of Energy-Electrical Energy Basics-Thermal Energy Basics-Units and Conversions.

Energy Management :Definition & Objectives of Energy Management -Energy Audit: Types and Methodology -Energy Audit Reporting Format -Understanding Energy Costs -Benchmarking and energy Performance -Matching Energy Usage to Requirement-Maximising System Efficiency -Fuel and Energy Substitution-Energy Audit Instruments.

UNIT III MATERIAL AND ENERGY BALANCE

Energy Balance: Basic Principles-The Sankey Diagram and its Use-Material Balances-Energy Balances-Method for Preparing Process Flow Chart-Facility as an Energy System How to Carryout Material and Energy (M & E) Balance. Case study.

UNIT IV PROJECT MANAGEMENT

Step in Project management-Project Definition and scope-Technical design-Financing-Contracting-Implementation-Project planning technique-Performance monitoring

UNIT V ENERGY MONITORING AND TARGETING

Energy monitoring: Definition-Elements of Monitoring & Targeting System-A Rationale for Monitoring, Targeting and Reporting -Data and Information Analysis -Relating-Energy Consumption and Production .

TEXT BOOK:

Guide book for National Certification Examination for Energy Management and Energy Auditors.

REFERENCES:

Energy Management Supply and Conservation, Butterworth Heinemann, 2002-Dr Clive Beggs
Energy Audit Report of National Productivity Council
Energy Management Hard Book, John Wiley and sons – Wayne C. Turner
www.bee-india.com

OBJECTIVES:

- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING 9

Definition –Need – General Characteristics, Applications. Fibers – Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices. Lamina Constitutive Equations: Lamina Assumptions – Macroscopic Viewpoint. Generalized Hooke's Law. Reduction to Homogeneous Orthotropic Lamina – Isotropic limit case, Orthotropic Stiffness matrix (Q_{ij}), Typical Commercial material properties, Rule of Mixtures. Generally Orthotropic Lamina –Transformation Matrix, Transformed Stiffness. Manufacturing: Bag Moulding Compression Moulding – Pultrusion – Filament Winding – Other Manufacturing Processes

UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS 9

Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of Laminated anisotropic plates. Laminate Constitutive Equations – Coupling Interactions, Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural Moduli. Evaluation of Lamina Properties from Laminate Tests. Quasi-Isotropic Laminates. Determination of Lamina stresses within Laminates.

UNIT III LAMINA STRENGTH ANALYSIS 9

Introduction - Maximum Stress and Strain Criteria. Von-Misses Yield criterion for Isotropic Materials. Generalized Hill's Criterion for Anisotropic materials. Tsai-Hill's Failure Criterion for Composites. Tensor Polynomial (Tsai-Wu) Failure criterion. Prediction of laminate Failure

UNIT IV THERMAL ANALYSIS 9

Assumption of Constant C.T.E's. Modification of Hooke's Law. Modification of Laminate Constitutive Equations. Orthotropic Lamina C.T.E's. C.T.E's for special Laminate Configurations – Unidirectional, Off-axis, Symmetric Balanced Laminates, Zero C.T.E laminates, Thermally Quasi-Isotropic Laminates

UNIT V ANALYSIS OF LAMINATED FLAT PLATES 9

Equilibrium Equations of Motion. Energy Formulations. Static Bending Analysis. Buckling Analysis. Free Vibrations – Natural Frequencies

TOTAL: 45 PERIODS**OUTCOMES:**

Upon the completion of this course the students will be able to

- | | | |
|-----|--|----|
| CO1 | Summarize the various types of Fibers, Equations and manufacturing methods for Composite materials | |
| CO2 | Derive Flat plate Laminate equations | |
| CO3 | Analyze Lamina strength | 74 |

- CO4 Analyze the thermal behavior of Composite laminates
- CO5 Analyze Laminate flat plates

TEXT BOOKS:

1. Gibson, R.F., "Principles of Composite Material Mechanics", Second Edition, McGraw-Hill, CRC press in progress, 1994, -.
2. Hyer, M.W., "Stress Analysis of Fiber – Reinforced Composite Materials", McGraw Hill, 1998

REFERENCES:

1. Agarwal, B.D., and Broutman L.J., "Analysis and Performance of Fiber Composites", John Wiley and Sons, New York, 1990.
2. Halpin, J.C., "Primer on Composite Materials, Analysis", Technomic Publishing Co., 1984.
3. Issac M. Daniel and Ori Ishai, "Engineering Mechanics of Composite Materials", Oxford University Press-2006, First Indian Edition - 2007
4. Mallick, P.K., Fiber, "Reinforced Composites: Materials, Manufacturing and Design", Maneeel Dekker Inc, 1993.
5. Mallick, P.K. and Newman, S., (edition), "Composite Materials Technology: Processes and Properties", Hansen Publisher, Munish, 1990.

20154E82A

PRODUCTION PLANNING AND CONTROL

L	T	P	C
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OBJECTIVES:

- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION

9

Objectives and benefits of planning and control-Functions of production control-Types of production- job- batch and continuous-Product development and design-Marketing aspect - Functional aspects- Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration- Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT II WORK STUDY

9

Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING

9

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING

9

Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems - Line of balance – Flow production scheduling- Batch production scheduling-Product sequencing – Production Control systems- Periodic batch control-Material requirement planning kanban – Dispatching-Progress reporting and expediting- Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC

9

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system-Determination of Economic order quantity and economic lot size- ABC analysis - Recorder procedure-Introduction to computer integrated production planning systems- elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
- They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOKS:

1. James. B. Dilworth, "Operations management – Design, Planning and Control for manufacturing and services" Mcgraw Hill International edition 1992.

2. Martand Telsang, “Industrial Engineering and Production Management”, First edition, S. Chand and Company, 2000.

REFERENCES:

1. Chary. S.N., “Theory and Problems in Production & Operations Management”, Tata McGraw Hill, 1995.
2. Elwood S.Buffa, and Rakesh K.Sarin, “Modern Production / Operations Management”, 8th Edition John Wiley and Sons, 2000.
3. Jain. K.C. & Aggarwal. L.N., “Production Planning Control and Industrial Management”, Khanna Publishers, 1990.
4. Kanishka Bedi, “Production and Operations management”, 2nd Edition, Oxford university press, 2007.
5. Melynk, Denzler, “ Operations management – A value driven approach” Irwin Mcgraw hill.
6. Norman Gaither, G. Frazier, “Operations Management” 9th Edition, Thomson learning IE, 2007
7. Samson Eilon, “Elements of Production Planning and Control”, Universal Book Corpn. 1984
8. Upendra Kachru, “ Production and Operations Management – Text and cases” 1st Edition, Excel books 2007

20154E82B

**COMPUTER INTEGRATED MANUFACTURING
SYSTEMS**

L T P C
3 0 0 3

OBJECTIVE:

- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT I INTRODUCTION

9

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM – Concurrent Engineering-CIM concepts – Computerised elements of CIM system – Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance – Simple problems – Manufacturing Control – Simple Problems – Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production.

**UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED
PROCESS PLANNING**

9

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control-Inventory Control – Brief on Manufacturing Resource Planning-II (MRP-II) & Enterprise Resource Planning (ERP) - Simple Problems.

UNIT III CELLULAR MANUFACTURING

9

Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems.

**UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED
GUIDED VEHICLE SYSTEM (AGVS)**

9

Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control – Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety.

UNIT V INDUSTRIAL ROBOTICS

9

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Robot Part Programming – Robot Accuracy and Repeatability – Simple Problems.

TOTAL : 45 PERIODS

OUTCOMES:

- CO1 Explain the basic concepts of CAD, CAM and computer integrated manufacturing systems
- CO2 Summarize the production planning and control and computerized process planning
- CO3 Differentiate the different coding systems used in group technology
- CO4 Explain the concepts of flexible manufacturing system (FMS) and automated guided vehicle (AGV) system
- CO5 Classification of robots used in industrial applications

TEXT BOOKS:

1. Mikell.P.Groover “Automation, Production Systems and Computer Integrated Manufacturing”, Prentice Hall of India, 2008.
2. Radhakrishnan P, Subramanyan S.and Raju V., “CAD/CAM/CIM”, 2nd Edition, New Age International (P) Ltd, New Delhi, 2000.

REFERENCES:

1. Gideon Halevi and Roland Weill, “Principles of Process Planning – A Logical Approach” Chapman & Hall, London, 1995.
2. Kant Vajpayee S, “Principles of Computer Integrated Manufacturing”, Prentice Hall India.
3. Rao. P, N Tewari &T.K. Kundra, “Computer Aided Manufacturing”, Tata McGraw Hill Publishing Company, 2000.

UNIT 1: FUELS AND COMBUSTION**9**

Introduction to Fuels -Properties of Liquid Fuels -Properties of Coal -Properties of Gaseous Fuels -Properties of Agro Residues -Combustion -Combustion of Oil Combustion of Coal -Combustion of Gas -Draft System - Combustion Controls.

9**UNIT2: BOILERS**

Introduction -Boiler Systems -Boiler Types and Classifications -Performance Evaluation of Boilers -Boiler Blowdown -Boiler Water Treatment -Energy Conservation Opportunities -Case Study.

9**UNIT3: STEAM SYSTEM**

Introduction-Properties of Steam -Steam Distribution -Steam Pipe Sizing and Design-Proper Selection, Operation and Maintenance of Steam Traps -Performance Assessment Methods for Steam Traps-Energy Saving Opportunities.

9**UNIT4: FURNACES AND INSULATION**

Types and Classification of Different Furnaces-Performance Evaluation of a Typical Furnace -General Fuel Economy Measures in Furnaces -Case Study -Purpose of Insulation -Types and Application -Calculation of Insulation Thickness Economic Thickness of Insulation(ETI) -Simplified Formula for Heat Loss Calculation.

9**UNIT 5: FBC BOILERS, COGENERATION AND WASTE HEAT RECOVERY**

Introduction -Mechanism of Fluidised Bed Combustion -Types of Fluidised Bed Combustion Boilers -Retrofitting of FBC Systems to Conventional Boilers -Advantages of Fluidised Bed Combustion Boilers-Need for Cogeneration - Principle of Cogeneration -Technical Options for Cogeneration -Classification of Cogeneration Systems -Factors Influencing Cogeneration Choice -Case Study -Introduction -Classification and Application -Benefits of Waste Heat Recovery - Development of a Waste Heat Recovery System -Commercial Waste Heat Recovery Devices.

TOTAL: 45 PERIODS**TEXT BOOK:**

Guide book for National Certification Examination for Energy Managers and Energy Auditors-Bureau of Energy Efficiency

REFERENCE BOOK :

1. Smith, CB Energy Management Principles, Pergamon Press, New York 1981
2. www.bee-india.com

OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES**10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS**9**

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION**9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES**8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS**OUTCOME:**

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

- Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
- Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

- Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
- Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
- Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and

- Engineers”, Oxford University Press, Oxford, 2001.
4. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
 5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

OPEN ELECTIVE-I

20150FE54A	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
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OBJECTIVES:

-
- To learn the fundamentals of data models
- To learn conceptual modeling using ER diagrams.
- To study SQL queries and database programming
- To learn proper designing of relational database.
- To understand database security concepts
- To understand Information retrieval techniques

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

Purpose of Database System – Data independence - Data Models – Database System Architecture – Conceptual Data modeling: ER models - Enhanced-ER Model. Introduction to relational databases – Relational Model – Keys – ER-to-Relational Mapping. Modeling of a library management system.

UNIT II DATABASE QUERYING 11

Relational Algebra – SQL: fundamentals – DDL – Specifying integrity constraints - DML – Basic retrieval queries in SQL - Complex SQL retrieval queries – nested queries – correlated queries – joins - aggregate functions. Creating a table, populating data, adding integrity constraints, querying tables with simple and complex queries.

UNIT III DATABASE PROGRAMMING 9

Database programming with function calls, stored procedures - views – triggers. Embedded SQL. ODBC connectivity with front end tools. Implementation using ODBC/JDBC and SQL/PSM, implementing functions, views, and triggers in MySQL / Oracle.

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

Functional Dependencies – Design guidelines – Normal Forms: first, second, third – Boyce/Codd Normal Form – Normalization algorithms. Design of a banking database system / university database system.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Database security issues – Discretionary access control – role based access – Encryption and public key infrastructures – challenges. Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

OUTCOMES:

At the end of the course, the student should be able to:

-
- understand relational data model, evolve conceptual model of a given problem, its mapping to relational model and Normalization
- query the relational database and write programs with database connectivity
- understand the concepts of database security and information retrieval systems
-

TEXTBOOKS:

Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition , Pearson, 2011.

2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011

REFERENCES:

C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, —Database Management Systemsll, Fourth Edition, McGraw-Hill College Publications, 2015.

20150FE54B

CLOUD COMPUTING

L T P C

3 0 0 3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security – Application Security – Virtual Machine Security.

UNIT V CASE STUDIES 9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXTBOOKS:

85

1. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley & Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, And Security", CRC Press, 2017.

CO5: Understand the different biochemical measurements

TEXTBOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. (Units I, II & V)

REFERENCES:

1. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill Publisher, 2003.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.(Units II & IV)
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

OBJECTIVES:

-
- To elucidate on advantages of nanotechnology based applications in each industry
- To provide instances of contemporary industrial applications of nanotechnology
- To provide an overview of future technological advancements and increasing role of nanotechnology in each industry
-

UNIT I NANO ELECTRONICS 9

Advantages of nano electrical and electronic devices –Electronic circuit chips – Lasers - Micro and NanoElectromechanical systems – Sensors, Actuators, Optical switches,- Data memory – Lighting and Displays – Batteries - Fuel cells and Photo-voltaic cells – Electric double layer capacitors – Lead-free solder – Nanoparticle coatings for electrical products.

UNIT II BIONANOTECHNOLOGY 9

Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery –Nanosensors in Diagnosis– Neuro-electronic Interfaces– Therapeutic applications.

UNIT III TRANSMISSION SYSTEMS 9

Nanocatalysts – Smart materials – Heterogenous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors.

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry

UNIT V ALTERNATIVE ENERGY SOURCES 9

Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application– Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair-conditioners

TOTAL : 45 PERIODS**REFERENCES:**

1. Neelina H. Malsch (Ed.), Biomedical Nanotechnology, CRC Press (2005)
2. Udo H. Brinker, Jean-Luc Miesusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems, Wiley Publishers (2010).
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).

4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai, Polymer Nano composites, Woodhead publishing, (2006).
7. W.N. Chang, Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

20153FE54B	ENERGY CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

Understand and analyse the energy data of industries

- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

•

UNIT I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- **to analyse the energy data of industries.**
 - Can carryout energy accounting and balancing
 - Can suggest methodologies for energy savings
-

TEXTBOOKS:

Energy Manager Training Manual (4 Volumes⁹¹) available at www.energymanager training.com,a

website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987.

20154FE54A

RENEWABLE ENERGY SOURCES

L T P C
3 0 0 3

OBJECTIVES:

- To get exposure on solar radiation and its environmental impact to power.
- To know about the various collectors used for storing solar energy.
- To know about the various applications in solar energy.
- To learn about the wind energy and biomass and its economic aspects.
- To know about geothermal energy with other energy sources.

UNIT I PRINCIPLES OF SOLAR RADIATION 10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION 8

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS 7

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY 10

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY 9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.

- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
 Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXTBOOKS:

1. Rai G.D. , “Non-Conventional Energy Sources”, Khanna Publishers, 2011
2. Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis), 2011

REFERENCES:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U , “Renewable Energy Technologies”,Narosa Publishing House, 2004
3. Mittal K M , “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”, P.H.I, New Delhi, 2010

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

Automotive engines- External combustion engines –Internal combustion engines -classification of engines- SI Engines- CI Engines- two stroke engines -four stroke engines- construction and working principles - IC engine components- functions and materials -valve timing –port timing diagram- Injection system -Unit injector system- Rotary distributor type - Electronically controlled injection system for SI engines-CI engines-Ignition system - Electronic ignition system -Transistorized ignition system, capacitive discharge ignition system.

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

Vehicle construction and different Chassis layouts –classifications of chassis- types of frames- frameless chassis construction –articulated vehicles- vehicle body - Vehicle aerodynamics-various resistances and its effects - steering system –conventional –sophisticated vehicle- and types of steering gear box-Power Steering- Steering geometry-condition for true rolling motion-Ackermann's- Devi's steering system - types of stub axle – Types of rear axles.

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints – Hotchkiss Drive and Torque Tube Drive- rear axle- Differential-wheels and tyres.

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

Suspension Systems- conventional Suspension Systems -independent Suspension Systems –leaf spring – coil spring –taper-lite - eligo,s spring Types of brakes -Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control. Derive the equation of Forces acting while applying a brakes on plain surface - inclined road-gradient .

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell. Turbo chargers -Engine emission control by three way catalytic converter system.

Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

OUTCOMES:**At the end of the course, the student should be able to:**

- Upon completion of this course, the students will be able to identify the different components in automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXTBOOKS:

- Ganesan V. "Internal Combustion Engines", Third Edition, Tata McGraw-Hill, 2007.
2. Jain K.K. and Asthana .R.B, "Automobile Engineering" Tata McGraw Hill Publishers, New Delhi, 2002.
 3. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

REFERENCES:

- Heinz Heisler, "Advanced Engine Technology," SAE International Publications USA, 1998.
2. Joseph Heitner, "Automotive Mechanics," Second Edition, East-West Press, 1999.
 3. Martin W, Stockel and Martin T Stockle , "Automotive Mechanics Fundamentals," The Good heart –Will Cox Company Inc, USA ,1978.
 4. Newton ,Steeds and Garet, "Motor Vehicles", Butterworth Publishers,1989.

20155FE54A	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

-
- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.
-

UNIT I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

-
- basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.
-

TEXTBOOKS: 97

- Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.
 3. Anjaneyulu. Y, “Air Pollution and Control Technologies”, Allied Publishers (P) Ltd., India 2002.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak, “Air Pollution”, Lweis Publishers, 2000.
2. Arthur C. Stern, “Air Pollution (Vol.I – Vol.VIII)”, Academic Press, 2006.
3. Wayne T.Davis, “Air Pollution Engineering Manual”, John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, “Air Pollution”, Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, “Environmental Pollution Control Engineering”, New Age International(P) Limited Publishers,2006.

OBJECTIVES:

-
- To introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes.
-

UNIT I FUNDAMENTALS OF GIS**9**

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS**9**

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III DATA INPUT AND TOPOLOGY**9**

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser –Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV DATA ANALYSIS**9**

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V APPLICATIONS**9**

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to:

-
- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output
-

TEXTBOOKS:

Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing,

2nd Edition, 2011. 2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCES:

Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

OPEN ELECTIVE II

20150FE74A

INTRODUCTION TO C PROGRAMMING

L T P C

3 0 0 3 OBJECTIVES

- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions and structures

UNIT I INTRODUCTION

9

Structure of C program – Basics: Data Types – Constants – Variables - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers Text Book: ReemaThareja (Chapters 2,3)

UNIT II ARRAYS

9

Introduction to Arrays – One dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort - Find whether the given is matrix is diagonal or not. Text Book: ReemaThareja (Chapters 5)

UNIT III STRINGS

9

Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Introduction to Pointers – Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names. Text Book: ReemaThareja (Chapters 6 & 7)

UNIT IV FUNCTIONS

9

Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by 'n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function) Text Book: ReemaThareja (Chapters 4)

UNIT V STRUCTURES

9

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions) Text Book: ReemaThareja (Chapters 8)

TOTAL:45 PERIODS

OUTCOMES

Upon completion of this course, the students will be able to

- Develop simple applications using basic constructs

- Develop applications using arrays and strings
- Develop applications using functions and structures

TEXT BOOK

1. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016

REFERENCES:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication
3. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd., 2011
4. PradipDey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009

OBJECTIVES:

- To understand the various algorithm design and analysis techniques
- To learn linear data structures – lists, stacks, and queues
- To learn different sorting and searching algorithms
- To understand Tree and Graph data structures

UNIT I ALGORITHM ANALYSIS, LIST ADT**11**

Algorithms: Notation - analysis – running time calculations. Abstract Data Types (ADTs): List ADT – array-based implementation – linked list implementation – singly linked lists- applications of lists: Polynomial Manipulation. Implementation of List ADT using an array and using a linked list in C.

UNIT II STACKS AND QUEUES**7**

Stack ADT - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix- Recursion. Queue ADT – Priority Queue - applications of queues. Implementation of Stack ADT and palindrome checking using C. Implementation of Queue operations using arrays in C.

UNIT III SEARCHING AND SORTING ALGORITHMS**10**

Divide and conquer methodology - Searching: Linear Search - Binary Search. Sorting: Insertion sort – Merge sort – Quick sort – Heap sort. Analysis of searching and sorting techniques. Implementation of linear search, binary search, insertion sort, merge sort and quick sort algorithms in C.

UNIT IV TREES**9**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree ADT – applications of trees. Heap – applications of heap. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C. Implementation of heap and heap sorting using arrays in C.

UNIT V GRAPHS**8**

Definition – Representation of Graph – Breadth-first traversal - Depth-first traversal – Dynamic programming Technique – Warshall’s and Floyd’s algorithm – Greedy method - Dijkstra’s algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra’s algorithm in C

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of this course, the students should be able to:

- Implement linear data structures and solve problems using them
- Implement and apply trees and graphs to solve problems.
- Implement the various searching and sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 1997.
2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson Education, 1988.

REFERENCES:

1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
2. S.Sridhar, "Design and Analysis of Algorithms", First Edition, Oxford University Press. 2014
3. Byron Gottfried, Jitender Chhabra, "Programming with C" (Schaum's Outlines Series), McGraw Hill Higher Ed., III Edition, 2010
4. Yashvant Kanetkar, "Data Structures Through C", BPB publications, II edition, 2003

OBJECTIVES:

□ To understand the functions of the basic components of a Robot. □ To study the use of various types of End of Effectors and Sensors □ To impart knowledge in Robot Kinematics and Programming □ To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT**6**

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS**9**

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingere and Three Fingere Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION**12**

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING**13**

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS**5**

RGV, AGV; Implementation of Robots in Industries-Variouse Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS OUTCOME:

□ Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS: 1. Klafter R.D., ChmielewskiT.A and Negin M., “Robotic Engineering - An Integrated Approach”, Prentice Hall, 2003. 2. GrooverM.P., “Industrial Robotics -Technology Programming and Applications”, McGraw Hill, 2001.

OBJECTIVES:**The student should be made to:**

- Introduce the concept of diodes, Bipolar Junction Transistors and FET
- Study the various model parameters of Transistors
- Learn the concept of special semiconductor devices, Power & Display devices
- Impart the knowledge of various configurations, characteristics and applications.

UNIT I SEMICONDUCTOR DIODE**9**

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS**9**

NPN -PNP -Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC - Hybrid -p model - h-parameter model, Ebers Moll Model- GummelPoonmodel, Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS**9**

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET- Characteristics- Threshold voltage -Channel length modulation, DMOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES**9**

Metal-Semiconductor Junction - MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Point Contact Diode, p-i-n Diode, Avalanche Photodiode, Schottky barrier diode Zener diode-Varactor diode – Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES**9**

UJT, Thyristor - SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS**OUTCOMES:****After this course, the student should be able to:**

- Analyze the characteristics of semiconductor diodes.
- Analyze and solve problems of Transistor circuits using model parameters.
- Identify and characterize diodes and various types of transistors.
- Analyze the characteristics of special semiconductor devices.
- Analyze the characteristics of Power and Display devices.

TEXT BOOKS:

1. Millman and Halkias, “Electronic Devices and Circuits”, 4th Edition, McGraw Hill, 2015.

2. Mohammad Rashid, "Electronic Devices and Circuits", Cengage Learning Pvt. Ltd, 2015.
3. Salivahanan. S, Suresh Kumar. N, "Electronic Devices and circuits", 4TH Edition, McGraw Hill, 2016.

REFERENCES:

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th Edition, McGraw Hill, 2012.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
3. Bhattacharya and Sharma, "Solid State Electronic Devices", 2nd Edition, Oxford University Press, 2014.
4. R.S.Sedha, "A Textbook of Electronic Devices and Circuits", 2nd Edition, S.Chand Publications, 2008.
5. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

OBJECTIVES:

To Provide knowledge

- About the stand alone and grid connected renewable energy systems.
- Design of power converters for renewable energy applications.
- Wind electrical generators and solar energy systems.
- Power converters used for renewable energy systems.

UNIT I INTRODUCTION

9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION

Reference theory fundamentals-principle of operation and analysis: IG and PMSG

9

UNIT III POWER CONVERTERS

9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing

Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS

9

Stand alone operation of fixed and variability speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS

9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design of power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.
- Ability to design power converters used for hybrid renewable energy systems.

TEXT BOOK:

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi,2009.

REFERENCES:

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variability speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.

5. Andrzej M. Trzynadlowski, „Introduction to Modern Power Electronics“, Second edition, wiley India Pvt. Ltd, 2012.

OBJECTIVES

- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic understandings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT 9

Water Quality-physical- chemical and biological parameters of water- water quality requirement - potable water standards -wastewater effluent standards -water quality indices. Water purification systems in natural systems- physical processes-chemical processes and biological processes- primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification - sedimentation; Types; aeration and gas transfer – coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids- transport of colloidal particles, clariflocculation.

UNIT II INDUSTRIAL WATER TREATMENT 9

Filtration – size and shape characteristics of filtering media – sand filters hydraulics of filtration – design considerations – radial, upflow, highrate and multimedia filters, pressure filter. Water softening – lime soda, zeolite and demineralization processes – industrial water treatment for boilers.

UNIT III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and defluoridation –desalination - corrosion prevention and control – factors influencing corrosion – Langelier index – corrosion control measures.

UNIT IV WASTEWATER TREATMENT 9

Wastewater treatment – pre and primary treatment – equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics – biological oxidation – lagoons and stabilization basins – aerated lagoons – activated sludge process – trickling filtration – anaerobic decomposition.

UNIT V ADSORPTION AND OXIDATION PROCESSES 9

Chemical process – adsorption – theory of adsorption – ion exchange process – chemical oxidation – advanced oxidation process – sludge handling and disposal – miscellaneous treatment processes.

TOTAL: 45 PERIODS**OUTCOMES**

- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:

1. Metcalf and Eddy, “Wastewater Engineering”, 4th ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., “Industrial Water Pollution Control”, 2ndEdn., McGraw Hill Inc., 1989.

REFERENCES

1. S.P. Mahajan, "Pollution control in process industries", 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, "Green Chemistry: An Introductory Text", 2nd edition, RSC publishing, 2010.
3. C.S. Rao, "Environmental Pollution Control Engineering", New Age International, 2007.



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UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

B.TECH - FULL TIME

[REGULATION 2020]

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.

PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.

PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

- A. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- B. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- C. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- D. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- E. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- F. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- G. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- H. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- I. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- J. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- K. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- L. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES												
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	3	2	3	2	1	1	2	1	1	3	1	3
2	3	3	3	3	3	1	1	1	1	1	1	2	2
3	3	3	3	3	3	2	2	3	1	2	2	2	2

Contribution 1: Reasonable 2: Significant 3: Strong

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

B.TECH (FULL TIME) – ECE – R-2020

I - VIII SEMESTERS CURRICULUM

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S11	Communicative English	4	0	0	4
2.	20148S12	Engineering Mathematics I	4	0	0	4
3.	20149S13	Engineering Physics	3	0	0	3
4.	20149S14	Engineering Chemistry	3	0	0	3
5.	20154S15	Engineering Graphics	2	0	4	4
6.	20150S16	Problem Solving and Basics of Python Programming	3	0	0	3
PRACTICALS						
7.	20150L17	Problem Solving and Basics of Python Programming Lab	0	0	4	2
8.	20149L18	Physics and Chemistry Laboratory	0	0	4	2
Soft Skills Course						
9.	201AGIT	Induction Training Programme				2
TOTAL			19	0	12	27

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S21	Technical English	4	0	0	4
2.	20148S22	Engineering Mathematics II	4	0	0	4
3.	20149S23B	Physics for Electronics Engineering	3	0	0	3
4.	20153S24B	Circuit Analysis	4	0	0	4
5.	20153S25B	Basic Electrical And Instrumentation Engineering	3	0	0	3
6.	20152S26B	Electronic Devices	3	0	0	3
PRACTICALS						
7.	20154L27	Engineering Practices Laboratory	0	0	4	2
8.	20152L28B	Circuits and Devices Laboratory	0	0	4	2
Soft Skills Course						
9.	201AGIC	Indian Constitution				2
10.	201ASBE	Basic Behavioral Etiquette				2
TOTAL			21	0	8	29

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S31B	Linear Algebra and Partial Differential Equations	4	0	0	4
2.	20152S32	Control Systems Engineering	3	0	0	3
3.	20152S33	Fundamentals of Data Structures In C	3	0	0	3
4.	20152C34	Digital Electronics	3	0	0	3
5.	20152C35	Signals and Systems	4	0	0	4

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
6.	20152C36	Electronic Circuits- I	3	0	0	3
PRACTICALS						
7.	20152L37	Fundamentals of Data Structures In C Laboratory	0	0	4	2
8.	20152L38	Analog and Digital Circuits Laboratory	0	0	4	2
9.	20152L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
Soft Skills Course						
10.	201AGGS	Introduction to Gender Studies				2
TOTAL			20	0	10	27

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S41B	Probability and Random Processes	4	0	0	4
2.	20152C42	Electronic Circuits II	3	0	0	3
3.	20152C43	Communication Theory	3	0	0	3
4.	20152C44	Electromagnetic Fields	4	0	0	4
5.	20152C45	Linear Integrated Circuits	3	0	0	3
6.	20149S46	Environmental Science and Engineering	3	0	0	3
PRACTICALS						
7.	20152L47	Circuits Design and Simulation Laboratory	0	0	4	2
8.	20152L48	Linear Integrated Circuits Laboratory	0	0	4	2
Soft Skills Course						
9.	201AGCE	Community Engagement				2
10.	201ASGS	Technical, General Aptitude and Skill set Development				2
TOTAL			20	0	8	28

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152C51	Digital Communication	3	0	0	3
2.	20152C52	Discrete-Time Signal Processing	4	0	0	4
3.	20152S53	Computer Architecture and Organization	3	0	0	3
4.	201_ _OE54	Open Elective – I	3	0	0	3
5.	20152C55	Communication Networks	3	0	0	3
6.	20152E56_	Elective – I	3	0	0	3
PRACTICALS						
7.	20152L57	Digital Signal Processing Laboratory	0	0	4	2
8.	20152L58	Communication Systems Laboratory	0	0	4	2
9.	20152L59	Communication Networks Laboratory	0	0	4	2
Soft Skills Course						
10.	201AGIE	Innovation and Entrepreneurship				2
TOTAL			22	0	12	27

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152C61	Microprocessors and Microcontrollers	3	0	0	3
2.	20152C62	VLSI Design	3	0	0	3
3.	20152C63	Wireless Communication	3	0	0	3
4.	20152S64	Principles of Management	3	0	0	3
5.	20152C65	Transmission Lines and RF Systems	3	0	0	3
6.	20152E66_	Elective – II	3	0	0	3
PRACTICALS						
7.	20152L61	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8.	20152L62	VLSI Design Laboratory	0	0	4	2
9.	20152L63	Professional Communication	0	0	2	1
10.	20152L64	Technical Seminar	0	0	2	1
Soft Skills Course						
11.	201ASTT	Technical Training				2
TOTAL			18	0	12	26

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152C71	Antennas and Microwave Engineering	3	0	0	3
2.	20152C72	Optical Communication	3	0	0	3
3.	20152C73	Embedded and Real Time Systems	3	0	0	3
4.	201__OE74_	Open Elective – II	3	0	0	3
5.	20152C75	Adhoc and Wireless Sensor Networks	3	0	0	3
6.	20152E76_	Elective – III	3	0	0	3
PRACTICALS						
7.	20152L77	Embedded Laboratory	0	0	4	2
8.	20152L78	Advanced Communication Laboratory	0	0	4	2
TOTAL			18	0	8	22

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152E81_	Elective – IV	3	0	0	3
2.	20152E82_	Elective – V	3	0	0	3
PRACTICALS						
3.	20152P83	Project Work	0	0	20	10
4.	20152PEE	Programme Exit Examination	0	0	0	2
Soft Skills Course						
5.	201AGPE	Professional Ethics and Human Values				2
6.	201ASIM	Interview Skills Training and Mock Test				2
TOTAL			6	0	20	22
TOTAL NO. OF CREDITS:						208

LIST OF ELECTIVES

ELECTIVE - I (SEMESTER V)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20152E56A	Object Oriented Programming	3	0	0	3
2.	20152E56B	Medical Electronics	3	0	0	3
3.	20152E56C	Operating Systems	3	0	0	3
4.	20152E56D	Robotics and Automation	3	0	0	3
5.	20152E56E	Nano Technology and Applications	3	0	0	3
6.	20152E56F	Human Rights	3	0	0	3
7.	20152E56G	Total Quality Management	3	0	0	3

ELECTIVE – II (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20152E66A	Cryptography and Network Security	3	0	0	3
2.	20152E66B	Advanced Digital Signal Processing	3	0	0	3
3.	20152E66C	MEMS and NEMS	3	0	0	3
4.	20152E66D	Multimedia Compression and Communication	3	0	0	3
5.	20152E66E	CMOS Analog IC Design	3	0	0	3
6.	20152E66F	Wireless Networks	3	0	0	3
7.	20152E66G	Intellectual Property Rights	3	0	0	3

ELECTIVE – III (SEMESTER VII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20152E76A	Advanced Wireless Communication	3	0	0	3
2.	20152E76B	Cognitive Radio	3	0	0	3
3.	20152E76C	Foundation Skills in Integrated Product Development	3	0	0	3
4.	20152E76D	Machine Learning Techniques	3	0	0	3
5.	20152E76E	Electronics Packaging and Testing	3	0	0	3
6.	20152E76F	Mixed Signal IC Design	3	0	0	3
7.	20152E76G	Disaster Management	3	0	0	3

ELECTIVE – IV (SEMESTER VIII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20152E81A	Electro Magnetic Interference and Compatibility	3	0	0	3
2.	20152E81B	Low Power SoC Design	3	0	0	3
3.	20152E81C	Photonic Networks	3	0	0	3
4.	20152E81D	Compressive Sensing	3	0	0	3
5.	20152E81E	Digital Image Processing	3	0	0	3

ELECTIVE - V (SEMESTER VIII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20152E82A	Video Analytics	3	0	0	3
2.	20152E82B	DSP Architecture and Programming	3	0	0	3
3.	20152E82C	Satellite Communication	3	0	0	3
4.	20152E82D	Soft Computing	3	0	0	3
5.	20152E82E	Principles of Speech Processing	3	0	0	3
6.	20152E82F	Fundamentals of Nano Science	3	0	0	3

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – I (SEMESTER V)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	20150OE54A	Database Management Systems	3	0	0	3
2.		20150OE54B	Cloud Computing	3	0	0	3
3.	EEE	20153OE54A	Industrial Nano Technology	3	0	0	3
4.		20153OE54B	Energy Conservation and Management	3	0	0	3
5.	MECH	20154OE54A	Renewable Energy Sources	3	0	0	3
6.		20154OE54B	Automotive Systems	3	0	0	3
7.	CIVIL	20155OE54A	Air Pollution and Control Engineering	3	0	0	3
8.		20155OE54B	Geographic Information System	3	0	0	3

OPEN ELECTIVE – II (SEMESTER VII)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	20150OE74A	Introduction to C Programming	3	0	0	3
2.		20150OE74B	Data Structures and Algorithms	3	0	0	3
3.	EEE	20153OE74A	Basic Circuit Theory	3	0	0	3
4.		20153OE74B	Introduction to Renewable Energy Systems	3	0	0	3
5.	MECH	20154OE74A	Industrial Safety	3	0	0	3
6.		20154OE74B	Testing of Materials	3	0	0	3
7.	CIVIL	20155OE74A	Green Building Design	3	0	0	3
8.		20155OE74B	Waste Water Treatment	3	0	0	3

B.TECH (FULL TIME) – ECE – R-2020

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Sem .	Core Courses				Elective Courses				Foundation Courses		Program Exit Examination		CGP A Credits	Non-CGPA Credits		Total Credits
	Theory Courses		Practical Courses		Dept. Elective		Open Elective									
	Nos.	redit	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits				
I	02	07	02	04	-	-	-	-	04	14	-	-	25	01	02	27
II	03	10	02	04	-	-	-	-	03	11	-	-	25	02	04	29
III	05	16	03	05	-	-	-	-	01	04	-	-	25	01	02	27
IV	05	16	02	04	-	-	-	-	01	04	-	-	24	02	04	28
V	04	13	03	06	01	03	01	03	-	-	-	-	25	01	02	27
VI	05	15	02	04	01	03	-	-	-	-	-	-	24	01	02	26
VII	04	12	02	04	01	03	01	03	-	-	-	-	22	-	-	22
VIII	-	-	01	10	02	06	-	-	-	-	1	2	18	02	04	22
TOTAL CREDITS													188		20	208

20147S11

COMMUNICATIVE ENGLISH

L	T	P	C
4	0	0	4

OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations-fixed and semi-fixed expressions.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, learners will be able to:**

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.

- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

1. Board of Editors. **Using English** A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois. **English & Communication For Colleges**. Cengage Learning, USA: 2007
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively: Developing Speaking Skills for Business English**. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeevan Geeta. **Basic Communication Skills**, Foundation Books: 2013.

SEMESTER I

20148S12

ENGINEERING MATHEMATICS I

L	T	P	C
4	0	0	4

OBJECTIVES:

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., —Advanced Engineering Mathematics, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., —Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

20149S13

ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of this course,**

- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- The students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. —Engineering Physicsl. Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. —Engineering Physicsl. Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. —Engineering Physicsl. Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physicsl. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineersl. Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with Modern Physics‘. W.H.Freeman, 2007.

SEMESTER I**20149S14****ENGINEERING CHEMISTRY**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement. Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS**OUTCOMES:**

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, —A Textbook of Engineering Chemistry, S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, —Engineering Chemistry, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, —Engineering Chemistry, Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, —Engineering Chemistry, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, —Engineering Chemistry, Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, —Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.

SEMESTER I

20154S15

ENGINEERING GRAPHICS

L	T	P	C
2	0	4	4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**5+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to:

- Familiarize with the fundamentals and standards of Engineering graphics
- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Visualize and to project isometric and perspective sections of simple solids.

TEXT BOOKS:

1. Natrajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

2. Venugopal K. and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2008.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., —Engineering Drawing, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., —Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., —Engineering Drawing (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., —Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, —Engineering Graphics, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., —Engineering Drawing, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

- IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
- IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
- IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
- IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
- IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

20150S16

PROBLEM SOLVING AND BASICS OF PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, students will be able to**

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist``, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, —Introduction to Computation and Programming Using Python``, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

SEMESTER I

20150L17 PROBLEM SOLVING AND BASICS OF PYTHON PROGRAMMING LAB

L	T	P	C
0	0	4	2

OBJECTIVES

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

- Python 3 interpreter for Windows/Linux

OUTCOMES

Upon completion of the course, students will be able to:

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

TOTAL: 60 PERIODS

SEMESTER I**20149L18****PHYSICS AND CHEMISTRY LABORATORY****L T P C**
0 0 4 2**OBJECTIVES:**

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
 - a) Determination of wavelength, and particle size using Laser
 - b) Determination of acceptance angle in an optical fiber.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
5. Determination of wavelength of mercury spectrum – spectrometer grating
6. Determination of band gap of a semiconductor
7. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS**OUTCOMES:**

Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30 PERIODS**TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

SEMESTER I**201AGIT****INDUCTION TRAINING PROGRAMME**

L	T	P	C
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The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

Induction program	3 weeks duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

OBJECTIVES:

The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I	INTRODUCTION TECHNICAL ENGLISH	12
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Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing**- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** –subject verb agreement - compound words.

UNIT II	READING AND STUDY SKILLS	12
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Listening- Listening to longer technical talks and completing exercises based on them - **Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting charts, graphs- **Vocabulary Development**-vocabulary used in formal letters/emails and reports **Language Development**- impersonal passive voice, numerical adjectives.

UNIT III	TECHNICAL WRITING AND GRAMMAR	12
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Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- **Vocabulary Development**- sequence words- Misspelled words. **Language Development**- embedded sentences

UNIT IV	REPORT WRITING	12
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Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays--**Vocabulary Development**- finding suitable synonyms-paraphrasing-. **Language Development**- clauses- if conditionals.

UNIT V	GROUP DISCUSSION AND JOB APPLICATIONS	12
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Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey- **Vocabulary Development**- verbal analogies **Language Development**- reported speech

TOTAL PERIODS	60
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OUTCOMES:

At the end of the course learners will be able to:

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
3. Booth-L. Diana, **Project Work,** Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007

Additional Reading:

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

TEXT BOOKS :

1. Grewal B.S., —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., —Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., — Advanced Engineering Mathematics I, Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. —Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, —Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., —Advanced Engineering Mathematics —Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

OBJECTIVES:

To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption, emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO-ELECTRONIC DEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the students will able to

- Gain knowledge on classical and quantum electron theories, and energy band structures,
- Acquire knowledge on basics of semiconductor physics and its applications in various devices,
- Get knowledge on magnetic and dielectric properties of materials,
- Have the necessary understanding on the functioning of optical materials for optoelectronics,

- Understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. —Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, —Semiconductor Device Physics and Design, Springer, 2008.
3. Wahab, M.A. —Solid State Physics: Structure and Properties of Materials. Narosa Publishing House, 2009.

REFERENCES:

1. Garcia, N. & Damask, A. —Physics for Computer Science Students. Springer Verlag, 2012.
2. Hanson, G.W. —Fundamentals of Nanoelectronics. Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. —Nanotechnology: Understanding Small Systems. CRC Press, 2014

20153S24B

CIRCUIT ANALYSIS

L T P C
4 0 0 4**OBJECTIVES:**

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

UNIT I BASIC CIRCUITS ANALYSIS AND NETWORK TOPOLOGY 12

Ohm's Law – Kirchhoff's laws – Mesh current and node voltage method of analysis for D.C and A.C. circuits - Network terminology - Graph of a network - Incidence and reduced incidence matrices – Trees –Cutsets - Fundamental cutsets - Cutset matrix – Tie sets - Link currents and Tie set schedules - Twig voltages and Cutset schedules, Duality and dual networks.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency – Bandwidth - Q factor - Selectivity. Self inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multiwinding coupled circuits - Series, Parallel connection of coupled inductors - Single tuned and double tuned coupled circuits.

UNIT IV TRANSIENT ANALYSIS 12

Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidal excitation.

UNIT V TWO PORT NETWORKS 12

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of two port networks, Symmetrical properties of T and π networks.

TOTAL : 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Develop the capacity to analyze electrical circuits, apply the circuit theorems in real time
- Design and understand and evaluate the AC and DC circuits.

TEXT BOOKS:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, —Engineering Circuit Analysis, McGraw Hill Science Engineering, Eighth Edition, 11th Reprint 2016.
2. Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCES:

1. Charles K. Alexander, Mathew N.O. Sadiku, —Fundamentals of Electric Circuits, Fifth Edition, McGraw Hill, 9th Reprint 2015.

2. A. Bruce Carlson, —Circuits: Engineering Concepts and Analysis of Linear Electric Circuits, Cengage Learning, India Edition 2nd Indian Reprint 2009.
3. Allan H. Robbins, Wilhelm C. Miller, —Circuit Analysis Theory and Practice, Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

2015S25B

BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on

- Operation of Three phase electrical circuits and power measurement
- Working principles of Electrical Machines
- Working principle of Various measuring instruments

UNIT I AC CIRCUITS AND POWER SYSTEMS 9

Three phase power supply – Star connection – Delta connection – Balanced and Unbalanced Loads- Power equation – Star Delta Conversion – Three Phase Power Measurement - Transmission & Distribution of electrical energy – Over head Vs Underground system – Protection of power system – types of tariff – power factor improvement

UNIT II TRANSFORMER 9

Introduction - Ideal Transformer – Accounting For Finite Permeability And Core Loss – Circuit Model Of Transformer – Per Unit System – Determination Of Parameters Of Circuit Model Of Transformer – Voltage Regulation – Name Plate Rating – Efficiency – Three Phase Transformers - Auto Transformers

UNIT III DC MACHINES 9

Introduction – Constructional Features– Motoring and generation principle - Emf And Torque equation – Circuit Model – Methods of Excitation and magnetisation characteristics – Starting and Speed Control – Universal Motor

UNIT IV AC MACHINES 9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit, Single phase Induction motors -Construction– Types–starting and speed control methods. Alternator- working principle–Equation of induced EMF – Voltage regulation, Synchronous motors-working principle-starting methods – Torque equation – Stepper Motors – Brushless DC Motors

UNIT V MEASUREMENT AND INSTRUMENTATION 9

Type of Electrical and electronic instruments – Classification- Types of indicating Instruments – Principles of Electrical Instruments –Multimeters, Oscilloscopes- Static and Dynamic Characteristics of Measurement – Errors in Measurement – Transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course the students will be able to**

- Understand the concept of three phase power circuits and measurement.
- Comprehend the concepts in electrical generators, motors and transformers
- Choose appropriate measuring instruments for given application

TEXT BOOKS:

1. D P Kothari and I.J Nagarath, —Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint ,2016
2. Giorgio Rizzoni, —Principles and Applications of Electrical Engineering, McGraw Hill Education (India) Private Limited, 2010
3. S.K.Bhattacharya —Basic Electrical and Electronics Engineering, Pearson India, 2011

REFERENCES:

1. Del Toro ,|Electrical Engineering Fundamentals, Pearson Education, New Delhi, 2015.

2. Leonard S Bobrow, — Foundations of Electrical Engineering, Oxford University Press, 2013
3. Rajendra Prasad ,Fundamentals of Electrical engineering, Prentice Hall of India, 2006.
4. Mittle N., —Basic Electrical Engineering, Tata McGraw Hill Edition, 24th reprint 2016
5. A.E.Fitzgerald, David E Higginbotham and Arvin Gabel, —Basic Electrical Engineering, McGraw Hill Education (India) Private Limited, 2009.

OBJECTIVES:

To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

NPN -PNP -Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC - Hybrid π model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction- MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the students will be able to:

- Explain the V-I characteristic of diode, UJT and SCR
- Describe the equivalence circuits of transistors
- Operate the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

TEXT BOOKS:

1. Donald A Neaman, —Semiconductor Physics and Devices, Fourth Edition, Tata Mc GrawHill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, —Electronic Devices and circuits, Third Edition, Tata McGraw- Hill, 2008.

REFERENCES:

1. Robert Boylestad and Louis Nashelsky, —Electron Devices and Circuit Theory, Pearson Prentice Hall, 10th edition, July 2008.
2. R.S.Sedha, — A Text Book of Applied Electronics, S.Chand Publications, 2006.
3. Yang, —Fundamentals of Semiconductor devices, McGraw Hill International Edition, 1978.

OBJECTIVES:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE****13****Buildings:**

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE**18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

Basic Machining:

Simple Turning and Taper turning
Drilling Practice

Sheet Metal Work:

Forming & Bending:
Model making – Trays and funnels.
Different type of joints.

Machine assembly practice:

Study of centrifugal pump
Study of air conditioner

Demonstration on:

Smithy operations, upsetting, swaging, setting down and bending. Example –
Exercise – Production of hexagonal headed bolt.
Foundry operations like mould preparation for gear and step cone pulley.
Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 13

- Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- Fluorescent lamp wiring.
- Stair case wiring
- Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
- Measurement of energy using single phase energy meter.
- Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

- Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
- Study of logic gates AND, OR, EX-OR and NOT.
- Generation of Clock Signal.
- Soldering practice – Components Devices and Circuits – Using general purpose PCB.
- Measurement of ripple factor of HWR and FWR.

**TOTAL: 60
PERIODS**

OUTCOMES:

On successful completion of this course, the student will be able to

- Fabricate carpentry components and pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

OBJECTIVES:

- To learn the characteristics of basic electronic devices such as Diode, BJT, FET, SCR
 - To understand the working of RL, RC and RLC circuits
 - To gain hand on experience in Thevenin & Norton theorem, KVL & KCL, and Super Position Theorems
1. Characteristics of PN Junction Diode
 2. Zener diode Characteristics & Regulator using Zener diode
 3. Common Emitter input-output Characteristics
 4. Common Base input-output Characteristics
 5. FET Characteristics
 6. SCR Characteristics
 7. Clipper and Clamper & FWR
 8. Verifications Of Thevenin & Norton theorem
 9. Verifications Of KVL & KCL
 10. Verifications Of Super Position Theorem
 11. verifications of maximum power transfer & reciprocity theorem
 12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
 13. Transient analysis of RL and RC circuits

TOTAL : 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Analyze the characteristics of basic electronic devices
- Design RL and RC circuits
- Verify Thevenin & Norton theorem KVL & KCL, and Super Position Theorems

Aim:

- To understand the salient features of the Indian Constitution

Objectives:

- To make the students understand about the Democratic Rule and Parliamentary Administration.
- To appreciate the salient features of the Indian Constitution.
- To know the fundamental Rights and Constitutional Remedies.
- To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
- To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

Outcomes

- Democratic values and citizenship Training are gained.
- Awareness on Fundamental Rights are established.
- The functions of union Government and State Governments are learnt.
- The power and functions of the Judiciary learnt thoroughly.
- Appreciation of Democratic Parliamentary Rule is learnt.

UNIT I: The Making Of Indian constitution

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: Fundamental Rights And Fundamental Duties Of The Citizens

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties.

UNIT III: Directive Principles Of State Policy

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: The Union Executive, Unionparliament And Supreme Court

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister Rajya Sabha- Lok Sabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

UNIT V: State Council – Election System And Partliamentary Democracy In India

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

References:

1. Palekar S.A. Indian Constitution Government and politics, ABD Publications, India.
2. Aiyer Alladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. Kashyap Subash C Our Parliament, National Book, Trust New Delhi 1989.

20148S31B LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
4	0	0	4

OBJECTIVES:

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To understand the procedure to solve partial differential equations.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

UNIT I VECTOR SPACES 12

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT II LINEAR TRANSFORMATION AND DIAGONALIZATION 12

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformations - Eigenvalues and eigenvectors - Diagonalizability.

UNIT III INNER PRODUCT SPACES 12

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 12

Formation – Solutions of first order equations – Standard types and equations reducible to standard types – Singular solutions – Lagrange's linear equation – Integral surface passing through a given curve – Classification of partial differential equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT V FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Dirichlet's conditions – General Fourier series – Half range sine and cosine series - Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

TOTAL: 60 PERIODS**OUTCOMES:**

Upon successful completion of the course, students should be able to:

- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Demonstrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate their mastery by solving non - trivial problems related to the concepts and by proving simple theorems about the statements proven by the text.
- Able to solve various types of partial differential equations.
Able to solve engineering problems using Fourier series.

TEXTBOOKS:

1. Grewal B.S., —Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.

2. Friedberg, A.H., Insel, A.J. and Spence, L., —Linear Algebra, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Burden, R.L. and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. James, G. —Advanced Modern Engineering Mathematics, Pearson Education, 2007.
3. Kolman, B. Hill, D.R., —Introductory Linear Algebra, Pearson Education, New Delhi, First Reprint, 2009.
4. Kumaresan, S., —Linear Algebra – A Geometric Approach, Prentice – Hall of India, New Delhi, Reprint, 2010.
5. Lay, D.C., —Linear Algebra and its Applications, 5th Edition, Pearson Education, 2015.
6. O'Neil, P.V., —Advanced Engineering Mathematics, Cengage Learning, 2007.
7. Strang, G., —Linear Algebra and its applications, Thomson (Brooks/Cole), New Delhi, 2005.
8. Sundarapandian, V. —Numerical Linear Algebra, Prentice Hall of India, New Delhi, 2008.

OBJECTIVES:

- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION 9

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchronous -Multivariable control system

UNIT II TIME RESPONSE ANALYSIS 9

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number-PID control-Analytical design for PD, PI,PID control systems

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.

UNIT V CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS 9

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, the student should be able to:**

- Identify the various control system components and their representations.
- Analyze the various time domain parameters.
- Analysis the various frequency response plots and its system.
- Apply the concepts of various system stability criterions.
- Design various transfer functions of digital control system using state variable models.

TEXT BOOK:

1. M.Gopal, —Control System – Principles and Designl, Tata McGraw Hill, 4th Edition, 2012.

REFERENCES:

1. J.Nagrath and M.Gopal, —Control System Engineeringl, New Age International Publishers, 5th Edition, 2007.
2. K. Ogata, ‘Modern Control Engineering’, 5th edition, PHI, 2012.

3. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013.
4. Benjamin.C.Kuo, —Automatic control systemsll, Prentice Hall of India, 7th Edition,1995.

20152S33

FUNDAMENTALS OF DATA STRUCTURES IN C

L T P C
3 0 0 3**OBJECTIVES:**

- To learn the features of C
- To learn the linear and non-linear data structures
- To explore the applications of linear and non-linear data structures
- To learn to represent data using graph data structure
- To learn the basic sorting and searching algorithms

UNIT I C PROGRAMMING BASICS 9

Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting-searching – matrix operations.

UNIT II FUNCTIONS, POINTERS, STRUCTURES AND UNIONS 9

Functions – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic. Structures and unions - definition – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

UNIT III LINEAR DATA STRUCTURES 9

Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT IV NON-LINEAR DATA STRUCTURES 9

Trees – Binary Trees – Binary tree representation and traversals – Binary Search Trees – Applications of trees. Set representations - Union-Find operations. Graph and its representations – Graph Traversals.

UNIT V SEARCHING AND SORTING ALGORITHMS 9

Linear Search – Binary Search. Bubble Sort, Insertion sort – Merge sort – Quick sort - Hash tables – Overflow handling.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, students will be able to:**

- Implement linear and non-linear data structure operations using C
- Suggest appropriate linear / non-linear data structure for any given data set.
- Apply hashing concepts for a given problem
- Modify or suggest new data structure for an application
- Appropriately choose the sorting algorithm for an application

TEXTBOOKS:

1. Pradip Dey and Manas Ghosh, —Programming in C, Second Edition, Oxford University Press, 2011.
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

REFERENCES:

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, 1983.

3. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla , — Data Structures and Program Design in C, Second Edition, Pearson Education, 2007
4. Jean-Paul Tremblay and Paul G. Sorenson, —An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, 1991.

20152C34

DIGITAL ELECTRONICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic gates

UNIT I DIGITAL FUNDAMENTALS 9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

UNIT II COMBINATIONAL CIRCUIT DESIGN 9

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT V MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS 9

Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL.

Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course:**

- Use digital electronics in the present contemporary world
- Design various combinational digital circuits using logic gates
- Do the analysis and design procedures for synchronous and asynchronous sequential circuits
- Use the semiconductor memories and related technology
- Use electronic circuits involved in the design of logic gates

TEXT BOOK:

1. M. Morris Mano and Michael D. Ciletti, —Digital Design, 5th Edition, Pearson, 2014.

REFERENCES:

1. Charles H.Roth. —Fundamentals of Logic Design, 6th Edition, Thomson Learning, 2013.
2. Thomas L. Floyd, —Digital Fundamentals, 10th Edition, Pearson Education Inc, 2011
3. S.Salivahanan and S.Arivazhagan—Digital Electronics, Ist Edition, Vikas Publishing House pvt Ltd, 2012.
4. Anil K.Maini —Digital Electronics, Wiley, 2014.
5. A.Anand Kumar —Fundamentals of Digital Circuits, 4th Edition, PHI Learning Private Limited, 2016.
6. Soumitra Kumar Mandal — Digital Electronics, McGraw Hill Education Private Limited, 2016.

OBJECTIVES:

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids. Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

**UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 12**

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in Analysis of CT systems - Systems connected in series / parallel.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 12

Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 12

Impulse response – Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- To be able to determine if a given system is linear/causal/stable
- Capable of determining the frequency components present in a deterministic signal
- Capable of characterizing LTI systems in the time domain and frequency domain
- To be able to compute the output of an LTI system in the time and frequency domains

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, —Signals and Systems, Pearson, 2015. (Unit 1-V)

REFERENCES

1. B. P. Lathi, —Principles of Linear Systems and Signals, Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, —Signals & Systems - Continuous and Discrete, Pearson, 2007.
3. John Alan Stuller, —An Introduction to Signals and Systems, Thomson, 2007.

20152C36

ELECTRONIC CIRCUITS-I

L T P C
3 0 0 3**OBJECTIVES:**

- To understand the methods of biasing transistors
- To design and analyze single stage and multistage amplifier circuits
- To analyze the frequency response of small signal amplifiers
- To design and analyze the regulated DC power supplies.
- To troubleshoot and fault analysis of power supplies.

UNIT I BIASING OF DISCRETE BJT, JFET AND MOSFET 9

BJT– Need for biasing - DC Load Line and Bias Point – DC analysis of Transistor circuits - Various biasing methods of BJT – Bias Circuit Design - Thermal stability - Stability factors - Bias compensation techniques using Diode, thermistor and sensistor – Biasing BJT Switching Circuits-JFET - DC Load Line and Bias Point - Various biasing methods of JFET - JFET Bias Circuit Design - MOSFET Biasing - Biasing FET Switching Circuits.

UNIT II BJT AMPLIFIERS 9

Small Signal Hybrid π equivalent circuit of BJT – Early effect - Analysis of CE, CC and CB amplifiers using Hybrid π equivalent circuits - AC Load Line Analysis- Darlington Amplifier - Bootstrap technique - Cascade, Cascode configurations - Differential amplifier, Basic BJT differential pair – Small signal analysis and CMRR.

UNIT III SINGLE STAGE FET, MOSFET AMPLIFIERS 9

Small Signal Hybrid π equivalent circuit of FET and MOSFET - Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits - Basic FET differential pair- BiCMOS circuits.

UNIT IV FREQUENCY RESPONSE OF AMPLIFIERS 9

Amplifier frequency response – Frequency response of transistor amplifiers with circuit capacitors – BJT frequency response – short circuit current gain - cut off frequency – f_{α} , f_{β} and unity gain bandwidth – Miller effect - frequency response of FET - High frequency analysis of CE and MOSFET CS amplifier - Transistor Switching Times.

UNIT V POWER SUPPLIES AND ELECTRONIC DEVICE TESTING 9

Linear mode power supply - Rectifiers - Filters - Half-Wave Rectifier Power Supply - Full-Wave Rectifier Power Supply - Voltage regulators: Voltage regulation - Linear series, shunt and switching Voltage Regulators - Over voltage protection - BJT and MOSFET – Switched mode power supply (SMPS) - Power Supply Performance and Testing - Troubleshooting and Fault Analysis, Design of Regulated DC Power Supply.

TOTAL: 45 PERIODS**OUTCOMES:**

After studying this course, the student should be able to:

- Acquire knowledge of
 - Working principles, characteristics and applications of BJT and FET
 - Frequency response characteristics of BJT and FET amplifiers
- Analyze the performance of small signal BJT and FET amplifiers - single stage and multi stage amplifiers
- Apply the knowledge gained in the design of Electronic circuits

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010. (Unit I-IV)
2. Robert L. Boylestad and Louis Nasheresky, —Electronic Devices and Circuit Theory, 11th Edition, Pearson Education, 2013. (Unit V)

REFERENCES

1. Millman J, Halkias.C.and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
2. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, , Mc Graw Hill Education (India) Private Ltd., 2017.
3. Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.
4. David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. Rashid M, Microelectronics Circuits, Thomson Learning, 2007.

OBJECTIVES:

- To understand and implement basic data structures using C
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

LIST OF EXERCISES

1. Basic C Programs – looping, data manipulations, arrays
2. Programs using strings – string function implementation
3. Programs using structures and pointers
4. Programs involving dynamic memory allocations
5. Array implementation of stacks and queues
6. Linked list implementation of stacks and queues
7. Application of Stacks and Queues
8. Implementation of Trees, Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Linear search and binary search
11. Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
12. Implementation Hash functions, collision resolution technique

TOTAL:60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

- Write basic and advanced programs in C
- Implement functions and recursive functions in C
- Implement data structures using C
- Choose appropriate sorting algorithm for an application and implement it in a modularized way

OBJECTIVES:

The student should be made to:

- Study the Frequency response of CE, CB and CC Amplifier
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristics of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Perform SPICE simulation of Electronic Circuits
- Design and implement the Combinational and sequential logic circuits

LIST OF ANALOG EXPERIMENTS:

1. Design of Regulated Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers - Transfer characteristics, CMRR Measurement
5. Cascode and Cascade amplifiers
6. Determination of bandwidth of single stage and multistage amplifiers
7. Analysis of BJT with Fixed bias and Voltage divider bias using Spice
8. Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software like Spice
9. Analysis of Cascode and Cascade amplifiers using Spice
10. Analysis of Frequency Response of BJT and FET using Spice

LIST OF DIGITAL EXPERIMENTS

1. Design and implementation of code converters using logic gates(i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
2. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
3. Design and implementation of Multiplexer and De-multiplexer using logic gates
4. Design and implementation of encoder and decoder using logic gates
5. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
6. Design and implementation of 3-bit synchronous up/down counter

TOTAL : 60 PERIODS

OUTCOMES:

On completion of this laboratory course, the student should be able to:

- Design and Test rectifiers, filters and regulated power supplies.
- Design and Test BJT/JFET amplifiers.
- Differentiate cascode and cascade amplifiers.
- Analyze the limitation in bandwidth of single stage and multi stage amplifier
- Measure CMRR in differential amplifier
- Simulate and analyze amplifier circuits using PSpice.
- Design and Test the digital logic circuits.

20152L39

INTERPERSONAL SKILLS / LISTENING & SPEAKING

L	T	P	C
0	0	2	1

OBJECTIVES:**The Course will enable learners to:**

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

UNIT I

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL : 30PERIODS**OUTCOMES:****At the end of the course Learners will be able to:**

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

1. Brooks, Margaret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

201AGGS

INTRODUCTION TO GENDER STUDIES

L	T	P	C
0	0	0	2

UNIT I CONCEPTS

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

UNIT II FEMINIST THEORY

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, eco-feminist.

UNIT III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL

Rise of Feminism in Europe and America.

Women's Movement in India.

UNIT IV GENDER AND LANGUAGE

Linguistic Forms and Gender.

Gender and narratives.

UNIT V GENDER AND REPRESENTATION

Advertising and popular visual media.

Gender and Representation in Alternative Media.

Gender and social media.

SEMESTER IV

20148S41B

PROBABILITY AND RANDOM PROCESSES

L T P C
4 0 0 4

OBJECTIVES :

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 12

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL : 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students should be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept random processes in engineering disciplines.
- Understand and apply the concept of correlation and spectral densities.
- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Ibe, O.C., " Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.

2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3. Miller. S.L. and Childers. D.G., — Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4. Stark. H. and Woods. J.W., — Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.
5. Yates. R.D. and Goodman. D.J., —Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

20152C42

ELECTRONIC CIRCUITS II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give a comprehensive exposure to all types of amplifiers and oscillators constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To study about feedback amplifiers and oscillators principles
- To design oscillators.
- To study about turned amplifier.
- To understand the analysis and design of LC and RC oscillators, amplifiers, multi vibrators, power amplifiers and DC convertors.

UNIT I FEEDBACK AMPLIFIERS AND STABILITY 9

Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series-series, shunt-shunt and shunt-series feedback amplifiers-stability problem- Gain and Phase-margins-Frequency compensation.

UNIT II OSCILLATORS 9

Barkhausen criterion for oscillation – phase shift, Wien bridge - Hartley & Colpitt's oscillators – Clapp oscillator-Ring oscillators and crystal oscillators – oscillator amplitude stabilization.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers – Analysis of capacitor coupled single tuned amplifier —double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

Pulse circuits – attenuators – RC integrator and differentiator circuits – diode clampers and clippers – Multivibrators - Schmitt Trigger- UJT Oscillator.

UNIT V POWER AMPLIFIERS AND DC CONVERTERS 9

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect- Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Analyze different types of amplifier, oscillator and multivibrator circuits
- Design BJT amplifier and oscillator circuits
- Analyze transistorized amplifier and oscillator circuits
- Design and analyze feedback amplifiers
- Design LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, power amplifier and DC convertors.

TEXT BOOKS:

1. Sedra and Smith, —Micro Electronic Circuits||; Sixth Edition, Oxford University Press, 2011. (UNIT I, III,IV,V)
2. Jacob Millman, _Microelectronics', McGraw Hill, 2nd Edition, Reprinted, 2009. (UNIT I,II,IV,V)

REFERENCES:

1. Robert L. Boylestad and Louis Nasheresky, —Electronic Devices and Circuit Theory, 10th Edition, Pearson Education / PHI, 2008
2. David A. Bell, —Electronic Devices and Circuits, Fifth Edition, Oxford University Press, 2008.
3. Millman J. and Taub H., —Pulse Digital and Switching Waveforms, TMH, 2000.
4. Millman and Halkias. C., Integrated Electronics, TMH, 2007.

OBJECTIVES:

- To introduce the concepts of various analog modulations and their spectral characteristics
- To understand the properties of random process
- To know the effect of noise on communication systems
- To study the limits set by Information Theory

UNIT I AMPLITUDE MODULATION 9

Amplitude Modulation- DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope –comparison of different AM techniques, Superheterodyne Receiver

UNIT II ANGLE MODULATION 9

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT III RANDOM PROCESS 9

Random variables, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT V SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

TOTAL: 45

PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design AM communication systems
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems
- Gain knowledge in sampling and quantization

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, —Fundamentals of Communication Systems, Pearson Education 2014. (UNIT I-IV)
2. Simon Haykin, —Communication Systems, 4th Edition, Wiley, 2014.(UNIT I-V)

REFERENCES:

1. B.P.Lathi, —Modern Digital and Analog Communication Systems, 3rd Edition, Oxford University Press, 2007.

2. D.Roody, J.Coolen, —Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, —Probability, Random variables and Stochastic Processes, McGraw Hill, 3rd edition, 1991.
4. B.Sklar, —Digital Communications Fundamentals and Applications, 2nd Edition Pearson Education 2007
5. H P Hsu, Schaum Outline Series - —Analog and Digital Communications, TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson, 2001.

OBJECTIVES:

- To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials
- To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To understand wave propagation in lossless and in lossy media
- To be able to solve problems based on the above concepts

UNIT I INTRODUCTION 12

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem

UNIT III MAGNETOSTATICS 12

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques

UNIT IV TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS 12

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields

UNIT V PLANE ELECTROMAGNETIC WAVES 12

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

TOTAL: 60 PERIODS**OUTCOMES:****By the end of this course, the student should be able to:**

- Display an understanding of fundamental electromagnetic laws and concepts
- Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning
- Explain electromagnetic wave propagation in lossy and in lossless media
- Solve simple problems requiring estimation of electric and magnetic field quantities based on these concepts and laws

TEXT BOOKS:

1. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 1989 (UNIT I, II,III IV,V)

2. W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006 (UNIT I-V)

REFERENCES

1. D.J. Griffiths, Introduction to electrodynamics, 4th ed., Pearson (India), 2013
2. B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011
3. M.N.O. Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford (Asian Edition), 2015

20152C45

LINEAR INTEGRATED CIRCUITS

L T P C
3 0 0 3**OBJECTIVES:**

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – JFET Operational Amplifiers – LF155 and TL082.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronisation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, the student should be able to:**

- Design linear and non linear applications of OP – AMPS
- Design applications using analog multiplier and PLL
- Design ADC and DAC using OP – AMPS
- Generate waveforms using OP – AMP Circuits
- Analyze special function ICs

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, —Linear Integrated Circuitsl, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2. Sergio Franco, —Design with Operational Amplifiers and Analog Integrated Circuitsl, 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCES:

1. Ramakant A. Gayakwad, —OP-AMP and Linear ICsl, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, —Operational Amplifiers and Linear Integrated Circuitsl, Sixth Edition, PHI, 2001.
3. B.S.Sonde, —System design using Integrated Circuitsl , 2nd Edition, New Age Pub, 2001.
4. Gray and Meyer, —Analysis and Design of Analog Integrated Circuitsl, Wiley International,5th Edition, 2009.
5. William D.Stanley, —Operational Amplifiers with Linear Integrated Circuitsl, Pearson Education,4th Edition,2001.
6. S.Salivahanan & V.S. Kanchana Bhaskaran, —Linear Integrated Circuitsl, TMH,2nd Edition, 4th Reprint, 2016.

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, ‘_Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, ‘_Introduction to Environmental Engineering and Science’, 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, ‘_Environmental law’, Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, ‘—Textbook of Environmental Studies’, Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, ‘_Environmental Studies-From Crisis to Cure’, Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, ‘—Environmental Sciencel’, Cengage Learning India PVT, LTD, Delhi, 2014.

20152L47

CIRCUITS DESIGN AND SIMULATION LABORATORY

L T P C

0 0 4 2

OBJECTIVES:

- To gain hands on experience in designing electronic circuits
- To learn simulation software used in circuit design
- To learn the fundamental principles of amplifier circuits
- To differentiate feedback amplifiers and oscillators.
- To differentiate the operation of various multivibrators

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

TOTAL: 60 PERIODS

OUTCOMES:**On completion of this laboratory course, the student should be able to:**

- Analyze various types of feedback amplifiers
- Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
- Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

20152L48

LINEAR INTEGRATED CIRCUITS LABORATORY

L	T	P	C
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OBJECTIVES:

- To understand the basics of linear integrated circuits and available ICs
- To understand the characteristics of the operational amplifier.
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use SPICE software for circuit design

DESIGN AND TESTING OF THE FOLLOWING CIRCUITS

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators using Op-amp
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using Op-amp.
8. Astable and Monostable multivibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier, Clock synchronization
10. R-2R Ladder Type D- A Converter using Op-amp.
11. DC power supply using LM317 and LM723.
12. Study of SMPS

SIMULATION USING SPICE:

1. Active low-pass, High-pass and band-pass filters using Op-amp
2. Astable and Monostable multivibrators using NE555 Timer.
3. A/ D converter
4. Analog multiplier

TOTAL: 60 PERIODS

OUTCOMES:**On completion of this laboratory course, the student should be able to:**

- Design amplifiers, oscillators, D-A converters using operational amplifiers.
- Design filters using op-amp and performs an experiment on frequency response.
- Analyze the working of PLL and describe its application as a frequency multiplier.
- Design DC power supply using ICs.
- Analyze the performance of filters, multivibrators, A/D converter and analog multiplier using SPICE.

OBJECTIVES:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

LEARNING OUTCOMES:

After completing this course, student will be able to:

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

Credit

2 credit, 30 hours, at least 50% in field, compulsory for all students

Contents

Divided into four Modules, field immersion is part of each Unit

Course Structure: 2 Credits Course (1 Credit for Classroom and Tutorials and 1 Credit for Field Engagement)

S. No.	Module Title	Module Content	Assignment	aching/ Learning Methodology	No. of Classes
1	Appreciation of Rural Society	Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of 'soul of India lies in villages' (Gandhi), rural infrastructure	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	<ul style="list-style-type: none"> - Classroom discussions - Field visit** - Assignment Map 	<p>2</p> <p>4</p> <p>2</p>

2	Understanding rural economy & livelihood	Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Describe your analysis of rural household economy, its challenges and possible pathways to address them	- Field visit** - Group discussions in class - Assignment	3 4 1
3	Rural Institutions	Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration	How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	- Classroom - Field visit** - Group presentation of assignment	2 4 2
4	Rural Development Programmes	History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, MGNREGS, Pradhan Mantri Bachao, Beti Padhao, Pradhan Mantri Kisan Samman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	- Classroom - Each student selects one program for field visit** - Written assignment	2 4 2

20152C51

DIGITAL COMMUNICATION

L T P C
3 0 0 3**OBJECTIVES:**

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

UNIT I INFORMATION THEORY 9

Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memoryless channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman codes.

UNIT II WAVEFORM CODING & REPRESENTATION 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester

UNIT III BASEBAND TRANSMISSION & RECEPTION 9

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Eye pattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principle of DPSK.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder.

TOTAL:45 PERIODS**OUTCOMES:**

Upon completion of the course, the student should be able to

- Design PCM systems
- Design and implement base band transmission schemes
- Design and implement band pass signaling schemes
- Analyze the spectral characteristics of band pass signaling schemes and their noise performance
- Design error control coding schemes

TEXT BOOK:

1. S. Haykin, —Digital Communications, John Wiley, 2005 (Unit I –V)

REFERENCES

1. B. Sklar, —Digital Communication Fundamentals and Applications, 2nd Edition, Pearson Education, 2009
2. B.P.Lathi, —Modern Digital and Analog Communication Systems, 3rd Edition, Oxford University Press 2007.
3. H P Hsu, Schaum Outline Series - —Analog and Digital Communications, TMH 2006
4. J.G Proakis, —Digital Communication, 4th Edition, Tata Mc Graw Hill Company, 2001.

OBJECTIVES:

- To learn discrete fourier transform, properties of DFT and its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the effects of finite precision representation on digital filters
- To understand the fundamental concepts of multi rate signal processing and its applications
- To introduce the concepts of adaptive filters and its application to communication engineering

UNIT I DISCRETE FOURIER TRANSFORM 12

Review of signals and systems, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

UNIT II INFINITE IMPULSE RESPONSE FILTERS 12

Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT III FINITE IMPULSE RESPONSE FILTERS 12

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

UNIT IV FINITE WORD LENGTH EFFECTS 12

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS 12

DSP functionalities - circular buffering - DSP architecture - Fixed and Floating point architecture principles - Programming - Application examples.

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to

- Apply DFT for the analysis of digital signals and systems
- Design IIR and FIR filters
- Characterize the effects of finite precision representation on digital filters
- Design multirate filters
- Apply adaptive filters appropriately in communication systems

TEXT BOOK:

1. John G. Proakis & Dimitris G. Manolakis, —Digital Signal Processing – Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007. (UNIT I – V)

REFERENCES:

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, —Digital Signal Processing, Second Edition, Pearson Education / Prentice Hall, 2002.
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.
3. Sanjit K. Mitra, —Digital Signal Processing – A Computer Based Approach, Tata Mc Graw Hill, 2007.
4. Andreas Antoniou, —Digital Signal Processing, Tata Mc Graw Hill, 2006.

20152S53

COMPUTER ARCHITECTURE AND ORGANIZATION

L T P C
3 0 0 3**OBJECTIVES:**

- To make students understand the basic structure and operation of digital computer
- To familiarize with implementation of fixed point and floating-point arithmetic operations
- To study the design of data path unit and control unit for processor
- To understand the concept of various memories and interfacing
- To introduce the parallel processing technique

UNIT I COMPUTER ORGANIZATION & INSTRUCTIONS 9

Basics of a computer system: Evolution, Ideas, Technology, Performance, Power wall, Uniprocessors to Multiprocessors. Addressing and addressing modes. Instructions: Operations and Operands, Representing instructions, Logical operations, control operations.

UNIT II ARITHMETIC 9

Fixed point Addition, Subtraction, Multiplication and Division. Floating Point arithmetic, High performance arithmetic, Subword parallelism

UNIT III THE PROCESSOR 9

Introduction, Logic Design Conventions, Building a Datapath - A Simple Implementation scheme - An Overview of Pipelining - Pipelined Datapath and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions.

UNIT IV MEMORY AND I/O ORGANIZATION 9

Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.

UNIT V ADVANCED COMPUTER ARCHITECTURE 9

Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers - Introduction to Multiprocessor network topologies.

TOTAL:45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to

- Describe data representation, instruction formats and the operation of a digital computer
- Illustrate the fixed point and floating-point arithmetic for ALU operation
- Discuss about implementation schemes of control unit and pipeline performance
- Explain the concept of various memories, interfacing and organization of multiple processors
- Discuss parallel processing technique and unconventional architectures

TEXT BOOKS:

1. David A. Patterson and John L. Hennessey, —Computer Organization and Design, Fifth Edition, Morgan Kaufman / Elsevier, 2014. (UNIT I-V)
2. Miles J. Murdocca and Vincent P. Heuring, —Computer Architecture and Organization: An Integrated approach, Second edition, Wiley India Pvt Ltd, 2015 (UNIT IV,V)

REFERENCES

1. V. Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, —Computer Organization—, Fifth edition, Mc Graw-Hill Education India Pvt Ltd, 2014.

2. William Stallings —Computer Organization and Architecture, Seventh Edition, Pearson Education, 2006.
3. Govindarajalu, —Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – I (SEMESTER V)

OPEN ELECTIVE – I
SEMESTER V

20150OE54A

DATABASE MANAGEMENT SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamentals of data models
- To learn conceptual modeling using ER diagrams.
- To study SQL queries and database programming
- To learn proper designing of relational database.
- To understand database security concepts
- To understand Information retrieval techniques

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

Purpose of Database System – Data independence - Data Models – Database System Architecture – Conceptual Data modeling: ER models - Enhanced-ER Model. Introduction to relational databases – Relational Model – Keys – ER-to-Relational Mapping. Modeling of a library management system.

UNIT II DATABASE QUERYING 11

Relational Algebra – SQL: fundamentals – DDL – Specifying integrity constraints - DML – Basic retrieval queries in SQL - Complex SQL retrieval queries – nested queries – correlated queries – joins – aggregate functions. Creating a table, populating data, adding integrity constraints, querying tables with simple and complex queries.

UNIT III DATABASE PROGRAMMING 7

Database programming with function calls, stored procedures - views – triggers. Embedded SQL. ODBC connectivity with front end tools. Implementation using ODBC/JDBC and SQL/PSM, implementing functions, views, and triggers in MySQL / Oracle.

UNIT IV DATABASE DESIGN 9

Functional Dependencies – Design guidelines – Normal Forms: first, second, third – Boyce/Codd Normal Form – Normalization algorithms. Design of a banking database system / university database system.

UNIT V ADVANCED TOPICS 9

Database security issues – Discretionary access control – role based access – Encryption and public key infrastructures – challenges. Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

- Understand relational data model, evolve conceptual model of a given problem, its mapping to relational model and Normalization
- Query the relational database and write programs with database connectivity
- Understand the concepts of database security and information retrieval systems

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson, 2011.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

20150OE54B

CLOUD COMPUTING

L T P C
3 0 0 3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security – Application Security – Virtual Machine Security.

UNIT V CASE STUDIES 9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, First Edition, John Wiley & Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management, And Security”, CRC Press, 2017.

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

20153OE54A

INDUSTRIAL NANO TECHNOLOGY

L T P C
3 0 0 3

OBJECTIVES

- To elucidate on advantages of nanotechnology based applications in each industry
- To provide instances of contemporary industrial applications of nanotechnology
- To provide an overview of future technological advancements and increasing role of nanotechnology in each industry

UNIT I NANO ELECTRONICS 9

Advantages of nano electrical and electronic devices –Electronic circuit chips – Lasers - Micro and NanoElectromechanical systems – Sensors, Actuators, Optical switches,- Data memory –Lighting and Displays – Batteries - Fuel cells and Photo-voltaic cells – Electric double layer capacitors – Lead-free solder – Nanoparticle coatings for electrical products.

UNIT II BIONANOTECHNOLOGY 9

Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery – Nanosensors in Diagnosis– Neuro-electronic Interfaces– Therapeutic applications.

UNIT III NANOTECHNOLOGY IN CHEMICAL INDUSTRY 9

Nanocatalysts – Smart materials – Heterogenous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors.

UNIT IV NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY 9

Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry.

UNIT V NANOTECHNOLOGY IN TEXTILES AND COSMETICS 9

Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application– Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair-conditioners.

TOTAL: 45 PERIODS

REFERENCES:

1. Neelina H. Malsch (Ed.), Biomedical Nanotechnology, CRC Press (2005)
2. Udo H. Brinker, Jean-Luc Mieusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems, Wiley Publishers (2010).
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).
4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai, Polymer Nano composites, Woodhead publishing, (2006).
7. W.N. Chang, Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

20153OE54B

ENERGY CONSERVATION AND MANAGEMENT

L T P C
3 0 0 3

OBJECTIVES:

At the end of the course, the student is expected to

- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

UNIT I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., “The Efficient Use of Energy” Butterworths, London, 1982
4. Turner. W.C., “Energy Management Hand book”, Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, “Energy Management”, Butterworths, London 1987.

201540E54A

RENEWABLE ENERGY SOURCES

L T P C
3 0 0 3

OBJECTIVES:

- To get exposure on solar radiation and its environmental impact to power.
- To know about the various collectors used for storing solar energy.
- To know about the various applications in solar energy.
- To learn about the wind energy and biomass and its economic aspects.
- To know about geothermal energy with other energy sources.

UNIT II SOLAR ENERGY COLLECTION 8

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS 7

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY 10

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY: 9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL : 45 PERIODS

OUTCOMES:

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXT BOOKS:

1. Rai G.D., “Non-Conventional Energy Sources”, Khanna Publishers, 2011
2. Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis), 2011

REFERENCES:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U , “Renewable Energy Technologies”,Narosa Publishing House, 2004

3. Mittal K M , “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”, P.H.I, New Delhi, 2010.

201540E54B

AUTOMOTIVE SYSTEMS

OPEN ELECTIVE – I
SEMESTER V
L T P C
3 0 0 3

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system.

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

Automotive engines- External combustion engines –Internal combustion engines -classification of engines-SI Engines- CI Engines- two stroke engines -four stroke engines- construction and working principles - IC engine components- functions and materials -valve timing –port timing diagram- Injection system -Unit injector system- Rotary distributor type - Electronically controlled injection system for SI engines-CI engines-Ignition system - Electronic ignition system -Transistorized ignition system, capacitive discharge ignition system.

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

Vehicle construction and different Chassis layouts –classifications of chassis- types of frames- frameless chassis construction –articulated vehicles- vehicle body - Vehicle aerodynamics-various resistances and its effects - steering system –conventional – sophisticated vehicle- and types of steering gear box-Power Steering- Steering geometry-condition for true rolling motion-Ackermann’s- Devi’s steering system - types of stub axle – Types of rear axles.

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints – Hotchkiss Drive and Torque Tube Drive- rear axle- Differential-wheels and tyres.

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

Suspension Systems- conventional Suspension Systems -independent Suspension Systems –leaf spring – coil spring –taper-lite - eligo,s spring Types of brakes -Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control. Derive the equation of Forces acting while applying a brakes on plain surface -inclined road-gradient.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell. Turbo chargers -Engine emission control by three way catalytic converter system.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to:

- identify the different components in automobile engineering.
- have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOKS:

1. Ganesan V. “Internal Combustion Engines”, Third Edition, Tata McGraw-Hill, 2007.
2. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002.
3. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

REFERENCES:

1. Heinz Heisler, “Advanced Engine Technology,” SAE International Publications USA, 1998.
2. Joseph Heitner, “Automotive Mechanics,” Second Edition, East-West Press, 1999.
3. Martin W, Stockel and Martin T Stockle , “Automotive Mechanics Fundamentals,” The Good heart –Will Cox Company Inc, USA ,1978.
4. Newton ,Steeds and Garet, “Motor Vehicles”, Butterworth Publishers,1989.

20155OE54A

AIR POLLUTION AND CONTROL ENGINEERING

L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:

- Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2004.
- Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.
- Anjaneyulu. Y, “Air Pollution and Control Technologies”, Allied Publishers (P) Ltd., India 2002.

REFERENCES:

- David H.F. Liu, Bela G. Liptak, “Air Pollution”, Lweis Publishers, 2000.
- Arthur C. Stern, “Air Pollution (Vol.I – Vol.VIII)”, Academic Press, 2006.
- Wayne T.Davis, “Air Pollution Engineering Manual”, John Wiley & Sons, Inc, 2000.
- M.N Rao and HVN Rao, “Air Pollution”,Tata Mcgraw Hill Publishing Company limited,2007.
- C.S.Rao, “Environmental Pollution Control Engineering”,New Age International(P) Limited Publishers,2006.

20155OE54B

GEOGRAPHIC INFORMATION SYSTEM

L T P C
3 0 0 3

OBJECTIVES:

- To introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes.

UNIT I FUNDAMENTALS OF GIS 9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS 9

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III DATA INPUT AND TOPOLOGY 9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser –Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV DATA ANALYSIS 9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V APPLICATIONS 9

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

This course equips the student to

- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCE:

1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

20152C55 COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:**The student should be made to:**

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

UNIT I FUNDAMENTALS & LINK LAYER 9

Overview of Data Communications- Networks – Building Network and its types– Overview of Internet - Protocol Layering - OSI Mode – Physical Layer – Overview of Data and Signals - introduction to Data Link Layer - Link layer Addressing- Error Detection and Correction

UNIT II MEDIA ACCESS & INTERNETWORKING 9

Overview of Data link Control and Media access control - Ethernet (802.3) - Wireless LANs – Available Protocols – Bluetooth – Bluetooth Low Energy – WiFi – 6LowPAN–Zigbee - Network layer services – Packet Switching – IPV4 Address – Network layer protocols (IP, ICMP, Mobile IP)

UNIT III ROUTING 9

Routing - Unicast Routing – Algorithms – Protocols – Multicast Routing and its basics – Overview of Intradomain and interdomain protocols – Overview of IPV6 Addressing – Transition from IPV4 to IPV6

UNIT V APPLICATION LAYER 9

Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP - DNS- - Electronic Mail (SMTP, POP3, IMAP, MIME) – Introduction to Peer to Peer Networks – Need for Cryptography and Network Security – Firewalls.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Identify the components required to build different types of networks
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Trace the flow of information from one node to another node in the network

TEXT BOOK:

1. Behrouz A. Forouzan, —Data communication and Networking, Fifth Edition, Tata McGraw –Hill, 2013 (UNIT I –V)

REFERENCES

1. James F. Kurose, Keith W. Ross, —Computer Networking - A Top-Down Approach Featuring the Internet, Seventh Edition, Pearson Education, 2016.
2. Nader. F. Mir,— Computer and Communication Networks, Pearson Prentice Hall Publishers, 2nd Edition, 2014.

3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, —Computer Networks: An Open Source Approach, Mc Graw Hill Publisher, 2011.
4. Larry L. Peterson, Bruce S. Davie, —Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers, 2011.

LIST OF ELECTIVES

ELECTIVE – I (SEMESTER V)

**ELECTIVE – I
SEMESTER V**

20152E56A

OBJECT ORIENTED PROGRAMMING

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions - built in exceptions, creating own exception, Stack Trace Elements.

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter thread communication, daemon threads, thread groups.

Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces

- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

TEXT BOOKS:

1. Herbert Schildt, —Java The complete referencel, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentalsl, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, —Java SE 8 for programmersl, 3rd Edition, Pearson, 2015.
2. Steven Holzner, —Java 2 Black bookl, Dreamtech press, 2011.
3. Timothy Budd, —Understanding Object-oriented programming with Javall, Updated Edition, Pearson Education, 2000.

20152E56B

MEDICAL ELECTRONICS

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made:

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters
- To study about the various assist devices used in the hospitals
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO₂, PCO₂, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the student should be able to:

- Know the human body electro- physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

TEXT BOOK:

1. Leslie Cromwell, —Biomedical Instrumentation and Measurement, Prentice Hall of India, New Delhi, 2007. (UNIT I – V)

REFERENCES:

1. Khandpur, R.S., —Handbook of Biomedical Instrumentation, TATA Mc Graw-Hill, New Delhi, 2003.
2. John G.Webster, —Medical Instrumentation Application and Design, 3rd Edition, Wiley India Edition, 2007
3. Joseph J.Carr and John M.Brown, —Introduction to Biomedical Equipment Technology, John Wiley and Sons, New York, 2004.

20152E56C

OPERATING SYSTEMS

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM OVERVIEW 7

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS 9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT V CASE STUDY 9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Interprocess Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.

- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers and compare iOS and Android Operating Systems.

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES :

1. Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
2. Achyut S. Godbole, Atul Kahate, — Operating Systems, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, —Modern Operating Systems, Second Edition, Pearson Education, 2004.
4. Gary Nutt, —Operating Systems, Third Edition, Pearson Education, 2004.
5. Harvey M. Deital, —Operating Systems, Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, —Understanding the Linux kernel, 3rd edition, O'Reilly, 2005.
7. Neil Smyth, —iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

20152E56D

ROBOTICS AND AUTOMATION

L T P C
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the basic concepts associated with the design, functioning, applications and social aspects of robots
- To study about the electrical drive systems and sensors used in robotics for various applications
- To learn about analyzing robot kinematics, dynamics through different methodologies and study various design aspects of robot arm manipulator and end-effector
- To learn about various motion planning techniques and the associated control architecture
- To understand the implications of AI and other trending concepts of robotics

UNIT I FOUNDATION FOR BEGINNERS 9

Introduction -- brief history, definition, anatomy, types, classification, specification and need based applications; role and need of robots for the immediate problems of the society, future of mankind and automation-ethical issues; industrial scenario local and global, case studies on mobile robot research platform and industrial serial arm manipulator

UNIT II BUILDING BLOCKS OF A ROBOT 9

Types of electric motors - DC, Servo, Stepper; specification, drives for motors - speed & direction control and circuitry, Selection criterion for actuators, direct drives, non-traditional actuators; Sensors for localization, navigation, obstacle avoidance and path planning in known and unknown environments – optical, inertial, thermal, chemical, biosensor, other common sensors; Case study on choice of sensors and actuators for maze solving robot and self driving cars

UNIT III KINEMATICS, DYNAMICS AND DESIGN OF ROBOTS & END-EFFECTORS 9

Robot kinematics - Geometric approach for 2R, 3R manipulators, homogenous transformation using D-H representation, kinematics of WMR, Lagrangian formulation for 2R robot dynamics; Mechanical design aspects of a 2R manipulator, WMR; End-effector - common types and design case study.

UNIT IV NAVIGATION, PATH PLANNING AND CONTROL ARCHITECTURE 9

Mapping & Navigation – SLAM, Path planning for serial manipulators; types of control architectures - Cartesian control, Force control and hybrid position/force control, Behaviour based control, application of Neural network, fuzzy logic, optimization algorithms for navigation problems, programming methodologies of a robot

UNIT V AI AND OTHER RESEARCH TRENDS IN ROBOTICS 9

Application of Machine learning - AI, Expert systems; Tele-robotics and Virtual Reality, Micro & Nanorobots, Unmanned vehicles, Cognitive robotics, Evolutionary robotics, Humanoids

TOTAL: 45 PERIODS

OUTCOMES:

The student should be able to:

- Explain the concepts of industrial robots in terms of classification, specifications and coordinate systems, along with the need and application of robots & automation
- Examine different sensors and actuators for applications like maze solving and self driving cars.
- Design a 2R robot & an end-effector and solve the kinematics and dynamics of motion for robots.
- Explain navigation and path planning techniques along with the control architectures adopted for robot motion planning.
- Describe the impact and progress in AI and other research trends in the field of robotics.

TEXT BOOKS:

- 1.Saeed. B. Niku, Introduction to Robotics, Analysis, system, Applications, Pearson Educations, 2002
- 2.Roland Siegwart, Illah Reza Nourbakhsh, Introduction to Autonomous Mobile Robots, MIT Press, 2011

REFERENCES:

1. Richard David Klafner, Thomas A. Chmielewski, Michael Negin, Robotic engineering: an integrated approach, Prentice Hall, 1989
2. Craig, J. J., Introduction to Robotics: Mechanics and Control, 2nd Edition, Addison-Wesley, 1989.
3. K.S. Fu, R.C. Gonzalez and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987.
4. Wesley E Snyder R, Industrial Robots, Computer Interfacing and Control, Prentice Hall International Edition, 1988.
5. Robin Murphy, Introduction to AI Robotics, MIT Press, 2000
6. Ronald C. Arkin, Behavior-based Robotics, MIT Press, 1998
7. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 2005
8. Stefano Nolfi, Dario Floreano, Evolutionary Robotics – The Biology, Intelligence and Technology of Self-Organizing Machines (Intelligent Robotics and Autonomous Agents series), MIT Press, 2004.

20152E56E

NANO TECHNOLOGY AND APPLICATIONS

**L T P C
3 0 0 3**

OBJECTIVES:

- To provide a broad view of the nascent field of nanoscience and nanotechnology to undergraduates
- To explore the basics of nanomaterial synthesis and characterization.
- To introduce the applications of nanotechnology

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9

Basic Structure of Nanoparticles- Kinetics in Nanostructured Materials- Zero dimensional, size and shape of nanoparticles; one-dimensional and two dimensional nanostructures- clusters of metals and semiconductors, bio nano-particles.

UNIT II FABRICATION AND CHARACTERIZATION OF NANOMATERIALS 9

Types of Nanomaterials (Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Buckyballs, Nanotubes); Gas, liquid, and solid –phase synthesis of nanomaterials; Lithography techniques (Photolithography, Dip-pen and Electron beam lithography); Thin film deposition; Electrospinning. Bio-synthesis of nanomaterials.

UNIT III PROPERTIES AND MEASUREMENT OF NANOMATERIALS 9

Optical Properties: Absorption, Fluorescence, and Resonance; Methods for the measurement of nanomaterials; Microscopy measurements: SEM, TEM, AFM and STM. Confocal and TIRF imaging.

UNIT IV NANO STRUCTURES 9

Carbon Nanotubes, Fullerenes, Nanowires, Quantum Dots. Applications of nanostructures. Reinforcement in Ceramics, Drug delivery, Giant magnetoresistance, etc. Cells response to Nanostructures.

UNIT V APPLICATIONS OF NANOTECHNOLOGY 9

Nano electronics, Nano sensors, Nanotechnology in Diagnostics applications, Environmental and Agricultural Applications of nanotechnology, Nano technology for energy systems

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the basic science behind the properties of materials.
- Interpret the creation, characterization, and manipulation of nanoscale materials.
- Comprehend the exciting applications of nanotechnology at the leading edge of scientific research
- Apply their knowledge of nanotechnology to identify how they can be exploited for new applications.

TEXT BOOKS:

1. Springer Handbook of Nanotechnology by Bharat Bhushan 2004. (Unit I – V)
2. Encyclopedia of Nanotechnology - Hari Singh Nalwa 2004. (Unit I – V)

REFERENCES:

1. Nanomaterials, Nanotechnologies and Design: an Introduction to Engineers and Architects, D. Michael Ashby, Paulo Ferreira, Daniel L. Schodek, Butterworth-Heinemann, 2009.

2. Handbook of Nanophase and Nanostructured Materials (in four volumes), Eds: Z.L. Wang, Y. Liu, Z. Zhang, Kluwer Academic/Plenum Publishers, 2003.
3. Handbook of Nanoceramics and their Based Nanodevices (Vol. 2) Edited by Tseung-Yuen Tseng and Hari Singh Nalwa, American Scientific Publishers.

20152E56F

HUMAN RIGHTS

L T P C
3 0 0 3

OBJECTIVE:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL: 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., —Human Rights under International law and Indian Lawsl, Central Law Agency, Allahabad, 2014.
2. Chandra U., —Human Rightsl, Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

20152E56G

TOTAL QUALITY MANAGEMENT

L T P C
3 0 0 3

OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES 9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration-

ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, —Total Quality Managementll, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO9001-2015 standards

20152L57 DIGITAL SIGNAL PROCESSING LABORATORY

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OBJECTIVES:**The student should be made:**

- To perform basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB
- To implement FIR and IIR filters in MATLAB and DSP Processor
- To study the architecture of DSP processor
- To design a DSP system to demonstrate the Multi-rate and Adaptive signal processing concepts.

LIST OF EXPERIMENTS:**MATLAB / EQUIVALENT SOFTWARE PACKAGE**

1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Auto correlation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations

DSP PROCESSOR BASED IMPLEMENTATION

1. Study of architecture of Digital Signal Processor
2. Perform MAC operation using various addressing modes
3. Generation of various signals and random noise
4. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
5. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
6. Implement an Up-sampling and Down-sampling operation in DSP Processor

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Carryout basic signal processing operations
- Demonstrate their abilities towards MATLAB based implementation of various DSP systems
- Analyze the architecture of a DSP Processor
- Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals
- Design a DSP system for various applications of DSP

OBJECTIVES:**The student should be made:**

- To visualize the effects of sampling and TDM
- To Implement AM & FM modulation and demodulation
- To implement PCM & DM
- To simulate Digital Modulation schemes
- To simulate Error control coding schemes

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Line coding schemes
8. Simulation of ASK, FSK, and BPSK generation schemes
9. Simulation of DPSK, QPSK and QAM generation schemes
10. Simulation of signal constellations of BPSK, QPSK and QAM
11. Simulation of ASK, FSK and BPSK detection schemes
12. Simulation of Linear Block and Cyclic error control coding schemes
13. Simulation of Convolutional coding scheme
14. Communication link simulation

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Simulate & validate the various functional modules of a communication system
- Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes
- Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
- Simulate end-to-end communication Link

OBJECTIVES:

The student should be made to:

- Learn to communicate between two desktop computers
- Learn to implement the different protocols
- Be familiar with IP Configuration
- Be familiar with the various routing algorithms
- Be familiar with simulation tools

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Implementation of IP Commands such as ping, Traceroute, nslookup.
6. Implementation of IP address configuration.
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Implementation of Encryption and Decryption Algorithms using any programming language

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Communicate between two desktop computers
- Implement the different protocols
- Program using sockets.
- Implement and compare the various routing algorithms
- Use the simulation tool.

AIM:

To create a basic appreciation towards research process and awareness of various research publication.

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to standard laboratory precautions and best practices for experimental work
- To provide orientation for basic mathematical computation useful in basic research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

PREREQUISITES:

Basic mathematical and experimental skills and exposure to window-based computer operation system.

UNIT I

Introduction to Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Research Design – Steps in selection and formulation of research problem - Steps in research – Criteria of Good Research, Problems Encountered by Researchers in India.

UNIT II

Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs. Development of a research plan, Formulation of Hypothesis – Sampling techniques – Sampling error and sample size. Literature types- compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III

Methods of data collection – Primary and secondary data – observation – interview – Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises. Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection.

UNIT IV

Processing and analysis of data – editing – coding – transcription – tabulation – outline of statistical analysis- Uncertainty, accuracy and precision- Mean value; standard deviation; error on the mean-Using a spreadsheet for data analysis- Graphs and graph plotting-Least squares methods – descriptive statistics – elements of processing through computer- packages for analysis (Excel).

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals

and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references, Technical Presentation.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.
6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

Module – I

Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions-characteristics, traits and behavioral; entrepreneurial challenges.

Module-II

Module Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Module –III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Module-IV

Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Module – V

Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

COURSE OUTCOMES:

After the completion of the course, the students will be able to:

- Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
- Demonstrate an ability to design a business model canvas.
- Evaluate the various sources of raising finance for startup ventures.
- Understand the fundamentals of developing and presenting business pitching to potential investors.

REFERENCES:

- Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
- Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
- S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
- T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013)
- Osterwalder, Alex and Pigneur, Yves (2010) Business Model Generation.
- Kachru, Upendra, India Land of a Billion Entrepreneurs, Pearson
- Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Portfolio Penguin
- Bagchi, Subroto, (2012). MBA At 16: a Teenager's Guide to Business, Penguin Books
- Bansal, Rashmi, Stay Hungry Stay Foolish, CIIE, IIM Ahmedabad
- Bansal, Rashmi, (2013). Follow Every Rainbow, Westland.

- Mitra, Sramana (2008), Entrepreneur Journeys (Volume 1), Booksurge Publishing
- Abrams, R. (2006). Six-week Start-up, Prentice-Hall of India.
- Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing.
- Johnson, Steven (2011). Where Good Ideas comes from, Penguin Books Limited.
- Gabor, Michael E. (2013), Awakening the Entrepreneur Within, Primento.
- Guillebeau, Chris (2012), The \$100 startup: Fire your Boss, Do what you love and work better to live more, Pan Macmillan
- Kelley, Tom (2011), The ten faces of innovation, Currency Doubleday
- Prasad, Rohit (2013), Start-up sutra: what the angels won't tell you about business and life, Hachette India.

20152C61 MICROPROCESSORS AND MICROCONTROLLERS

L T P C
3 0 0 3**OBJECTIVES:**

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing – System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007. (UNIT I-III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education, 2011. (UNIT IV-V)

REFERENCES:

1. Douglas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH, 2012
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

OBJECTIVES:

- Study the fundamentals of CMOS circuits and its characteristics.
- Learn the design and realization of combinational & sequential digital circuits.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
- Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR 9

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Characteristics, C-V Characteristics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.

Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN 9

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.

Timing Issues : Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.

Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: *Ad Hoc* Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

TOTAL: 45 PERIODS

OUTCOMES:

UPON COMPLETION OF THE COURSE, STUDENTS SHOULD be ABLE TO

- Realize the concepts of digital building blocks using MOS transistor.
- Design combinational MOS circuits and power strategies.
- Design and construct Sequential Circuits and Timing systems.
- Design arithmetic building blocks and memory subsystems.
- Apply and implement FPGA design flow and testing.

TEXT BOOKS:

1. Neil H.E. Weste, David Money Harris —CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition, Pearson , 2017 (UNIT I,II,V)
2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, |Digital Integrated Circuits:A Design perspective, Second Edition , Pearson , 2016.(UNIT III,IV)

REFERENCES

1. M.J. Smith, —Application Specific Integrated Circuits, Addison Wesley, 1997
2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim —CMOS Digital Integrated Circuits: Analysis & Design, 4th edition McGraw Hill Education, 2013
3. Wayne Wolf, —Modern VLSI Design: System On Chip, Pearson Education, 2007
4. R.Jacob Baker, Harry W.L.L., David E.Boyee, —CMOS Circuit Design, Layout and Simulation, Prentice Hall of India 2005.

20152C63

WIRELESS COMMUNICATION

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OBJECTIVES:

- To study the characteristic of wireless channel
- To understand the design of a cellular system
- To study the various digital signaling techniques and multipath mitigation techniques
- To understand the concepts of multiple antenna techniques

UNIT II CELLULAR ARCHITECTURE 9

Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse - channel assignment- hand off- interference & system capacity-trunking & grade of service – Coverage and capacity improvement.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS 9

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV MULTIPATH MITIGATION TECHNIQUES 9

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES 9

MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TOTAL: 45 PERIODS**OUTCOMES:****The student should be able to:**

- Characterize a wireless channel and evolve the system design specifications
- Design a cellular system based on resource availability and traffic demands
- Identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration.

TEXT BOOKS:

1. Rappaport,T.S., —Wireless communications, Pearson Education, Second Edition,2010.(UNIT I, II, IV)
2. Andreas.F. Molisch, —Wireless Communications, John Wiley – India, 2006. (UNIT III,V)

REFERENCES:

1. Wireless Communication –Andrea Goldsmith, Cambridge University Press, 2011
2. Van Nee, R. and Ramji Prasad, —OFDM for wireless multimedia communications, Artech House, 2000
3. David Tse and Pramod Viswanath, — Fundamentals of Wireless Communication, Cambridge University Press, 2005.
4. Upena Dalal, —Wireless Communication, Oxford University Press, 2009.

20152S64 PRINCIPLES OF MANAGEMENT

L	T	P	C
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OBJECTIVE:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS**OUTCOME:**

- Upon completion of the course, students will be able to have clear understanding
- Managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

- Stephen P. Robbins & Mary Coulter, —Management, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
- JAF Stoner, Freeman R.E and Daniel R Gilbert —Management, Pearson Education, 6th Edition, 2004.

REFERENCES:

- Stephen A. Robbins & David A. Decenzo & Mary Coulter, —Fundamentals of Management”, Pearson Education, 7th Edition, 2011.
- Robert Kreitner & Mamata Mohapatra, — Management, Biztantra, 2008.
- Harold Koontz & Heinz Weihrich —Essentials of management, Tata McGraw Hill, 1998.
- Tripathy PC & Reddy PN, —Principles of Management, Tata McGraw Hill, 1999.

20152C65 TRANSMISSION LINES AND RF SYSTEMS

L	T	P	C
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OBJECTIVES:

- To introduce the various types of transmission lines and its characteristics
- To give thorough understanding about high frequency line, power and impedance measurements
- To impart technical knowledge in impedance matching using smith chart
- To introduce passive filters and basic knowledge of active RF components
- To get acquaintance with RF system transceiver design

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV WAVEGUIDES 9

General Wave behavior along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides.

UNIT V RF SYSTEM DESIGN CONCEPTS 9

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors Basic concepts of RF design, Mixers, Low noise amplifiers, voltage control oscillators, Power amplifiers, transducer power gain and stability considerations.

TOTAL: 45 PERIODS**OUTCOMES:**

Upon completion of the course, the student should be able to:

- Explain the characteristics of transmission lines and its losses
- Write about the standing wave ratio and input impedance in high frequency transmission lines
- Analyze impedance matching by stubs using smith charts
- Analyze the characteristics of TE and TM waves
- Design a RF transceiver system for wireless communication

TEXT BOOKS:

1. John D Ryder, —Networks, lines and fields, 2nd Edition, Prentice Hall India, 2015. (UNIT I-IV)
2. Mathew M. Radmanesh, —Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002. (UNIT V)

REFERENCES:

1. Reinhold Ludwig and Powel Bretchko, | RF Circuit Design – Theory and Applications|, Pearson Education Asia, First Edition, 2001.
2. D. K. Misra, —Radio Frequency and Microwave Communication Circuits- Analysis and Design|, John Wiley & Sons, 2004.
3. E.C.Jordan and K.G. Balmain, —Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

LIST OF ELECTIVES

ELECTIVE – II (SEMESTER VI)

ELECTIVE – II
SEMESTER VI

20152E66A CRYPTOGRAPHY AND NETWORK SECURITY

L T P C
3 0 0 3

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic- Elliptic curve cryptography.

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operations of public key cryptography
- Apply the various Authentication schemes to simulate different applications.
- Understand various Security practices and System security standards

TEXT BOOK:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2. Behrouz A. Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

20152E66B

ADVANCED DIGITAL SIGNAL PROCESSING

**L T P C
3 0 0 3**

OBJECTIVES:

- To learn and understand the concepts of stationary and non-stationary random signals and analysis & characterization of discrete-time random processes
- To enunciate the significance of estimation of power spectral density of random processes
- To introduce the principles of optimum filters such as Wiener and Kalman filters
- To introduce the principles of adaptive filters and their applications to communication engineering
- To introduce the concepts of multi-resolution analysis

UNIT I DISCRETE-TIME RANDOM PROCESSES 9

Random variables - ensemble averages a review, random processes - ensemble averages, autocorrelation and autocovariance matrices, ergodic random process, white noise, filtering random processes, spectral factorization, special types of random processes - AR, MA, ARMA

UNIT II SPECTRUM ESTIMATION 10

Bias and consistency, Non-parametric methods - Periodogram, modified-Periodogram - performance analysis. Bartlett's method, Welch's method, Blackman-Tukey method. Performance comparison. Parametric methods - autoregressive (AR) spectrum estimation - autocorrelation method, Prony's method, solution using Levinson Durbin recursion.

UNIT III OPTIMUM FILTERS 9

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

UNIT V MULTIREOLUTION ANALYSIS 8

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Articulate and apply the concepts of special random processes in practical applications
- Choose appropriate spectrum estimation techniques for a given random process
- Apply optimum filters appropriately for a given communication application
- Apply appropriate adaptive algorithm for processing non-stationary signals
- Apply and analyse wavelet transforms for signal and image processing based applications

TEXT BOOKS

1. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2008. (UNIT I-IV)
2. P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993 (UNIT V)

REFERENCES:

1. John G. Proakis & Dimitris G. Manolakis, —Digital Signal Processing – Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. Sophocles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000

20152E66C

MEMS AND NEMS

**L T P C
3 0 0 3**

OBJECTIVES:

- To introduce the concepts of micro and nano electromechanical devices
- To know the fabrication process of Microsystems
- To know the design concepts of micro sensors and micro actuators
- To introduce the concepts of quantum mechanics and nano systems

UNIT I INTRODUCTION TO MEMS AND NEMS 9

Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester

UNIT IV MICRO ACTUATORS 9

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study:RF Switch.

UNIT V NANO DEVICES 9

Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device: Gas sensor.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the student should be able to:

- Interpret the basics of micro/nano electromechanical systems including their applications and advantages
- Recognize the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
- Analyze the key performance aspects of electromechanical transducers including sensors and actuators
- Comprehend the theoretical foundations of quantum mechanics and Nano systems

REFERENCES:

1. Marc Madou, —Fundamentals of Microfabrication, CRC press 1997.
2. Stephen D. Senturia, Micro system Design, Kluwer Academic Publishers, 2001
3. Tai Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata Mcraw Hill, 2002.
4. Chang Liu, —Foundations of MEMS, Pearson education India limited, 2006,
5. Sergey Edward Lyshevski, —MEMS and NEMS: Systems, Devices, and Structures, CRC Press, 2002

20152E66D

MULTIMEDIA COMPRESSION AND COMMUNICATION

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made:

- To understand the compression schemes for text, voice, image and video
- To understand the QoS issues in multimedia network
- To know the communication protocols for multimedia networking

UNIT II IMAGE AND VIDEO COMPRESSION 9

Graphics Interchange format- Tagged image file format-Digitized documents- Digitized pictures-JPEG-Video Encoding-Motion estimation –Overview of H.263 and MPEG-2

UNIT IV GUARANTEED SERVICE MODEL 10

Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters – Quality of Service and metrics – WFQ and its variants – Random Early Detection – QoS aware Routing – Admission Control – Resource Reservation – RSVP - Traffic Shaping Algorithms – Caching – Laissez Faire Approach - Possible Architectures – An Overview of QoS Architectures

UNIT V MULTIMEDIA COMMUNICATION 10

Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Jitter – Fixed playout and Adaptive playout – Recovering from packet loss – RTSP – Multimedia Communication Standards – RTP/RTCP – SIP and H.263

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design audio compression techniques
- Configure Text, image and video compression techniques
- Select suitable service model for specific application
- Configure multimedia communication network

TEXT BOOK:

1. Fred Halsall, —Multimedia communication- Applications, Networks, Protocols and Standardsl, Pearson education, 2007.

REFERENCES

1. Tay Vaughan, —Multimedia Making it work , McGraw-Hill Osborne Media, 2006.
2. Kurose and W. Ross, —Computer Networking —A Top Down Approach, Pearson education, 3rd ed, 2005.
3. KR. Rao,Z S Bojkovic, D A Milovanovic, —Multimedia Communication Systems: Techniques, Standards, and Networksll, Pearson Education 2007

4. R. Steimnetz, K. Nahrstedt, —Multimedia Computing, Communications and Applications, Pearson Education, First ed, 1995.
5. Nalin K Sharda, _Multimedia Information Networking', Prentice Hall of India, 1999
6. Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, _Multimedia Wireless Networks: Technologies, Standards and QoS', Prentice Hall, 2003.
7. Ellen Kayata Wesel, _Wireless Multimedia Communications: Networking Video, Voice and Data', Addison Wesley, 1998

20152E66E

CMOS ANALOG IC DESIGN

**L T P C
3 0 0 3**

OBJECTIVES:

- To study the fundamentals of analog circuits and MOS device models
- To gain knowledge on various configurations of MOS transistors and feedback concepts
- To study the characteristics of noise and frequency response of the amplifier
- To learn the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

UNIT I INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS 9

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

UNIT II AMPLIFIERS AND FEEDBACK 9

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response-Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE 9

General considerations- Miller Effect and Association of Poles with Nodes, Common source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

UNIT IV OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION 9

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps-General consideration of stability and frequency compensation- Multipole system- Phase margin-Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

UNIT V SWITCHED CAPACITOR CIRCUITS AND PLLS 9

General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL-Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, student should be able to:

- Realize the concepts of Analog MOS devices and current mirror circuits.
- Design different configuration of Amplifiers and feedback circuits.
- Analyze the characteristics of frequency response of the amplifier and its noise.
- Analyze the performance of the stability and frequency compensation techniques of Op-Amp Circuits.
- Construct switched capacitor circuits and PLLs

TEXT BOOK:

1. Behzad Razavi, —Design of Analog CMOS Integrated Circuits, Tata McGraw Hill, 2001, 33rd re-print, 2016.

REFERENCES:

1. Phillip Allen and Douglas Holmberg —CMOS Analog Circuit Design| Second Edition, Oxford University Press, 2004.
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
3. Grebene, —Bipolar and MOS Analog Integrated circuit design|, John Wiley & sons, Inc., 2003

20152E66F

WIRELESS NETWORKS

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made:

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To have in depth knowledge on internetworking of WLAN and WWAN
- To learn about evolution of 4G Networks, its architecture and applications

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT IV INTERNETWORKING BETWEEN WLANS AND WWANS 9

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V 4G & Beyond 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student would be able to:

- Conversant with the latest 3G/4G networks and its architecture
- Design and implement wireless network environment for any application using latest wireless protocols and standards
- Ability to select the suitable network depending on the availability and requirement
- Implement different type of applications for smart phones and mobile devices with latest network strategies

TEXT BOOKS:

1. Jochen Schiller, ‖Mobile Communications‗, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, —Wireless Communications and networking‗, First Edition, Elsevier 2007. (Unit IV,V)

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, —Wireless Networking, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, —Modern Wireless Communications, First Edition, Pearson Education 2013

20152E66G

INTELLECTUAL PROPERTY RIGHTS

L T P C
3 0 0 3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL: 45 PERIODS

OUTCOME:

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS:

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, —Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.

REFERENCES:

1. Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

20152L61 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

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OBJECTIVES:

- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:**8086 Programs using kits and MASM**

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

1. Traffic light controller
2. Stepper motor control
3. Digital clock
4. Key board and Display
5. Printer status
6. Serial interface and Parallel interface
7. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

1. Basic arithmetic and Logical operations
2. Square and Cube program, Find 2's complement of a number
3. Unpacked BCD to ASCII

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

OBJECTIVES:

The student should be made:

- To learn Hardware Descriptive Language(Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarize fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms

LIST OF EXPERIMENTS:**Part I: Digital System Design using HDL & FPGA (24 Periods)**

1. Design an Adder (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
2. Design a Multiplier (4 Bit Min) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
3. Design an ALU using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
4. Design a Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
5. Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
6. Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

Compare pre synthesis and post synthesis simulation for experiments 1 to 6.

Part-II Digital Circuit Design (24 Periods)

7. Design and simulate a CMOS inverter using digital flow
8. Design and simulate a CMOS Basic Gates & Flip-Flops
9. Design and simulate a 4-bit synchronous counter using a Flip-Flops

Manual/Automatic Layout Generation and Post Layout Extraction for experiments 7 to 9
Analyze the power, area and timing for experiments 7 to 9 by performing Pre Layout and Post Layout Simulations.

Part-III Analog Circuit Design (12 Periods)

10. Design and Simulate a CMOS Inverting Amplifier.
11. Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers.

Analyze the input impedance, output impedance, gain and bandwidth for experiments 10 and 11 by performing Schematic Simulations.

Design and simulate simple 5 transistor differential amplifier. Analyze Gain, Bandwidth and CMRR by performing Schematic Simulations.

TOTAL :60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Write HDL code for basic as well as advanced digital integrated circuit
- Import the logic modules into FPGA Boards
- Synthesize Place and Route the digital IPs
- Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools

20152L63

PROFESSIONAL COMMUNICATION

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OBJECTIVES:**The course aims to:**

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview - one to one interview & panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL : 30 PERIODS

OUTCOMES:**At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. Globearena
2. Win English

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students,. OrientBlackSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

20152C71

ANTENNAS AND MICROWAVE ENGINEERING

L T P C
3 0 0 3**OBJECTIVES:**

- To enable the student to understand the basic principles in antenna and microwave system design
- To enhance the student knowledge in the area of various antenna designs.
- To enhance the student knowledge in the area of microwave components and antenna for practical applications.

UNIT III ANTENNA ARRAYS AND APPLICATIONS 9

Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas.

UNIT IV PASSIVE AND ACTIVE MICROWAVE DEVICES 9

Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.

UNIT V MICROWAVE DESIGN PRINCIPLES 9

Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design

TOTAL: 45 PERIODS**OUTCOMES:****The student should be able to:**

- Apply the basic principles and evaluate antenna parameters and link power budgets
- Design and assess the performance of various antennas
- Design a microwave system given the application specifications

TEXTBOOKS:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006. (UNIT I, II, III)
2. David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.(UNIT I,IV,V)

REFERENCES:

1. Constantine A.Balanis, —Antenna Theory Analysis and Design, Third edition, John Wiley India Pvt Ltd., 2005.
2. R.E.Collin, "Foundations for Microwave Engineering", Second Edition, IEEE Press, 2001.

OBJECTIVES:

- To study about the various optical fiber modes, configuration and transmission characteristics of optical fibers
- To learn about the various optical sources, detectors and transmission techniques
- To explore various idea about optical fiber measurements and various coupling techniques
- To enrich the knowledge about optical communication systems and networks

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Introduction-general optical fiber communication system- basic optical laws and definitions-optical modes and configurations -mode analysis for optical propagation through fibers-modes in planar wave guide-modes in cylindrical optical fiber-transverse electric and transverse magnetic modes- fiber materials-fiber fabrication techniques-fiber optic cables-classification of optical fiber-single mode fiber-graded index fiber.

UNIT II TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER 9

Attenuation-absorption --scattering losses-bending losses-core and cladding losses-signal dispersion – inter symbol interference and bandwidth-intra modal dispersion-material dispersion- waveguide dispersion-polarization mode dispersion-intermodal dispersion-dispersion optimization of single mode fiber-characteristics of single mode fiber-R-I Profile-cutoff wave length-dispersion calculation-mode field diameter.

UNIT III OPTICAL SOURCES AND DETECTORS 9

Sources: Intrinsic and extrinsic material-direct and indirect band gaps-LED-LED structures-surface emitting LED-Edge emitting LED-quantum efficiency and LED power-light source materials-modulation of LED-LASER diodes-modes and threshold conditions-Rate equations-external quantum efficiency-resonant frequencies-structures and radiation patterns-single mode laser-external modulation-temperature effort.

Detectors: PIN photo detector-Avalanche photo diodes-Photo detector noise-noise sources-SNR-detector response time-Avalanche multiplication noise-temperature effects-comparisons of photo detectors.

UNIT IV OPTICAL RECEIVER, MEASUREMENTS AND COUPLING 9

Fundamental receiver operation-preamplifiers-digital signal transmission-error sources-Front end amplifiers-digital receiver performance-probability of error-receiver sensitivity-quantum limit. Optical power measurement-attenuation measurement-dispersion measurement- Fiber Numerical Aperture Measurements- Fiber cut- off Wave length Measurements- Fiber diameter measurements-Source to Fiber Power Launching-Lensing Schemes for Coupling Management-Fiber to Fiber Joints-LED Coupling to Single Mode Fibers-Fiber Splicing-Optical Fiber connectors.

UNIT V OPTICAL COMMUNICATION SYSTEMS AND NETWORKS 9

System design consideration Point – to –Point link design –Link power budget –rise time budget, WDM –Passive DWDM Components-Elements of optical networks-SONET/SDH-Optical Interfaces-SONET/SDH Rings and Networks-High speed light wave Links-OADM configuration-Optical ETHERNET-Soliton.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Realize basic elements in optical fibers, different modes and configurations.
- Analyze the transmission characteristics associated with dispersion and polarization techniques.

- Design optical sources and detectors with their use in optical communication system.
- Construct fiber optic receiver systems, measurements and coupling techniques.
- Design optical communication systems and its networks.

TEXT BOOKS:

1. P Chakrabarti, "Optical Fiber Communication", McGraw Hill Education (India) Private Limited, 2016 (UNIT I, II, III)
2. Gerd Keiser, "Optical Fiber Communication", McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013. (UNIT I, IV, V)

REFERENCES:

1. John M.Senior, —Optical fiber communication, Pearson Education, Second Edition.2007.
2. Rajiv Ramaswami, —Optical Networks — , Second Edition, Elsevier , 2004.
3. J.Gower, —Optical Communication System, Prentice Hall of India, 2001.
4. Govind P. Agrawal, —Fiber-optic communication systems, third edition, John Wiley & Sons, 2004.

20152C73 EMBEDDED AND REAL TIME SYSTEMS

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OBJECTIVES:**The student should be made to:**

- Understand the concepts of embedded system design and analysis
- Learn the architecture and programming of ARM processor
- Be exposed to the basic concepts of embedded programming
- Learn the real time operating systems

UNIT I INTRODUCTION TO EMBEDDED SYSTEM DESIGN 9

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform-level performance analysis.

UNIT II ARM PROCESSOR AND PERIPHERALS 9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

UNIT III EMBEDDED PROGRAMMING 9

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT IV REAL TIME SYSTEMS 9

Structure of a Real Time System — Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronisation.

UNIT V PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems- POSIX-Windows CE. - Distributed embedded systems – MPSoCs and shared memory multiprocessors. – Design Example - Audio player, Engine control unit – Video accelerator.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Describe the architecture and programming of ARM processor
- Outline the concepts of embedded systems
- Explain the basic concepts of real time operating system design
- Model real-time applications using embedded-system concepts

TEXT BOOKS:

1. Marilyn Wolf, —Computers as Components - Principles of Embedded Computing System
2. Design, Third Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
3. Jane W.S.Liu, Real Time Systems, Pearson Education, Third Indian Reprint, 2003. (UNIT IV)

REFERENCES:

1. Lyla B.Das, —Embedded Systems : An Integrated Approach|| Pearson Education, 2013.
2. Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time Interfacing||, Third Edition Cengage Learning, 2012.
3. David. E. Simon, —An Embedded Software Primer||, 1st Edition, Fifth Impression, Addison Wesley Professional, 2007.
4. Raymond J.A. Buhr, Donald L.Bailey, —An Introduction to Real-Time Systems- From Design to Networking with C/C++||, Prentice Hall, 1999.
5. C.M. Krishna, Kang G. Shin, —Real-Time Systems||, International Editions, Mc Graw Hill 1997
6. K.V.K.K.Prasad, —Embedded Real-Time Systems: Concepts, Design & Programming||, Dream Tech Press, 2005.
7. Sriram V Iyer, Pankaj Gupta, —Embedded Real Time Systems Programming||, Tata Mc Graw Hill, 2004.

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – II (SEMESTER VII)

OPEN ELECTIVE – II
SEMESTER VII

20150OE74A INTRODUCTION TO C PROGRAMMING

L T P C
3 0 0 3

OBJECTIVES:

- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions and structures

UNIT I INTRODUCTION 9

Structure of C program –Basics: Data Types –Constants –Variables –Keywords –Operators: Precedence and Associativity –Expressions –Input/Output statements, Assignment statements – Decision-making statements –Switch statement –Looping statements –Pre-processor directives – Compilation process –Exercise Programs: Check whether the required amount can be withdrawn based on the available amount –Menu-driven program to find the area of different shapes –Find the sum of even numbers

UNIT II ARRAYS 9

Introduction to Arrays –One dimensional arrays: Declaration –Initialization –Accessing elements – Operations: Traversal, Insertion, Deletion, Searching –Two dimensional arrays: Declaration – Initialization –Accessing elements –Operations: Read –Print –Sum –Transpose –Exercise Programs: Print the number of positive and negative values present in the array –Sort the numbers using bubble sort –Find whether the given matrix is diagonal or not.

UNIT III STRINGS 9

Introduction to Strings –Reading and writing a string –String operations (without using built-in string functions): Length –Compare –Concatenate –Copy –Reverse –Substring –Insertion –Indexing – Deletion –Replacement –Array of strings –Introduction to Pointers –Pointer operators –Pointer arithmetic –Exercise programs: To find the frequency of a character in a string –To find the number of vowels, consonants and white spaces in a given text –Sorting the names.

UNIT IV FUNCTIONS 9

Introduction to Functions –Types: User-defined and built-in functions –Function prototype –Function definition –Function call –Parameter passing: Pass by value –Pass by reference –Built-in functions (string functions) –Recursive functions –Exercise programs: Calculate the total amount of power consumed by „n“ devices (passing an array to a function) –Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) –Replace the punctuations from a given sentence by the space character (passing an array to a function)

UNIT V STRUCTURES 9

Introduction to structures –Declaration –Initialization –Accessing the members –Nested Structures – Array of Structures –Structures and functions –Passing an entire structure –Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) –Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions)

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to:

- Develop simple applications using basic constructs
- Develop applications using arrays and strings
- Develop applications using functions and structures

TEXT BOOK:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

REFERENCES:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication.
3. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd., 2011.
4. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.

20150OE74B

DATA STRUCTURES AND ALGORITHMS

L T P C

3 0 0 3

OBJECTIVES:

- To understand the various algorithm design and analysis techniques.
- To learn linear data structures –lists, stacks, and queues.
- To learn different sorting and searching algorithms.
- To understand Tree and Graph data structures.

UNIT II S TACKS AND QUEUES

7

Stack ADT -Applications -Evaluating arithmetic expressions-Conversion of Infix to Postfix-Recursion. Queue ADT –Priority Queue -applications of queues. Implementation of Stack ADT and palindrome checking using C. Implementation of Queue operations using arrays in C.

UNIT III SEARCHING AND SORTING ALGORITHMS

10

Divide and conquer methodology -Searching: Linear Search -Binary Search. Sorting: Insertion sort – Merge sort –Quick sort –Heap sort. Analysis of searching and sorting techniques. Implementation of linear search, binary search, insertion sort, merge sort and quick sort algorithms in C.

UNIT IV TREES

9

Tree ADT –tree traversals -Binary Tree ADT –expression trees –binary search tree ADT –applications of trees.Heap –applications of heap. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C. Implementation of heap and heap sorting using arrays in C.

UNIT V GRAPHS

8

Definition – Representation of Graph –Breadth-first traversal -Depth-first traversal –Dynamic programming Technique –Warshall’s and Floyd’s algorithm –Greedy method -Dijkstra’s algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra’s algorithm in C.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students should be able to:

- Implement linear data structures and solve problems using them.
- Implement and apply trees and graphs to solve problems.
- Implement the various searching and sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Brian W.Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson Education, 1988.

REFERENCES:

1. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,1983.
2. S.Sridhar, “Design and Analysis of Algorithms”, First Edition, Oxford University Press. 2014.
3. Byron Gottfried,Jitender Chhabra, “Programming with C” (Schaum's Outlines Series), Mcgraw Hill Higher Ed., III Edition, 2010.
4. Yashvant Kanetkar, “Data Structures Through C”, BPB publications, II edition, 2003

20153OE74A

BASIC CIRCUIT THEORY

**L T P C
3 0 0 3**

OBJECTIVES:

- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuit equations using network theorems.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of three phase circuits.

UNIT I BASIC CIRCUITS ANALYSIS 9

Resistive elements -Ohm's Law Resistors in series and parallel circuits –Kirchoffs laws –Mesh current and node voltage -methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation –star delta conversion. Thevenins and Norton Theorems –Superposition Theorem –Maximum power transfer theorem – Reciprocity Theorem –Millman's theorem.

UNIT III AC CIRCUITS 9

Introduction to AC circuits , inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenins and Norton Theorems –Superposition Theorem –Maximum power transfer theorem –Reciprocity Theorem –Millman's theorem.

UNIT IV THREE PHASE CIRCUITS 9

A.C. circuits –Average and RMS value -Phasor Diagram –Power, Power Factor and Energy.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents –power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance –their frequency response –Quality factor and Bandwidth -Self and mutual inductance –Coefficient of coupling –Tuned circuits –Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to introduce electric circuits and its analysis.
- Ability to impart knowledge on solving circuit equations using network theorems.
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams and analysis of three phase circuits.

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, Cengage Learning India, 2013.

REFERENCES:

1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, “Network Analysis”, Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

20153OE74A

INTRODUCTION TO RENEWABLE ENERGY SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

To Provide knowledge

- About the stand alone and grid connected renewable energy systems.
- Design of power converters for renewable energy applications.
- Wind electrical generators and solar energy systems.
- Power converters used for renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Reference theory fundamentals-principle of operation and analysis: IG and PMSG.

UNIT III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) -Boost and buck-boost converters-selection of inverter, battery sizing, array sizing
Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9

Stand alone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems-Range and type of Hybrid systems-Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design of power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.
- Ability to design power converters used for hybrid renewable energy systems.

TEXT BOOK:

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press,2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company,New Delhi,2009.

REFERENCES:

1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variability speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
5. Andrzej M. Trzynadlowski, „Introduction to Modern Power Electronics“, Second edition, Wiley India Pvt. Ltd, 2012.

20154OE74A

INDUSTRIAL SAFETY

**L T P C
3 0 0 3**

OBJECTIVES :

To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION 9

Evolution of modern safety concepts –Fire prevention –Mechanical hazards –Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS 9

Chemical exposure –Toxic materials –Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene –Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL 9

Industrial Health Hazards –Environmental Control –Industrial Noise -Noise measuring instruments, Control of Noise, Vibration, -Personal Protection.

UNIT IV HAZARD ANALYSIS 9

System Safety Analysis –Techniques –Fault Tree Analysis (FTA), Failure Modes and Effects Analysis(FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS 9

Explosions –Disaster management –catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety –case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCES:

1. Safety Manual, “EDEL Engineering Consultancy”, 2000.
2. David L.Goetsch, “Occupational Safety and Health for Technologists”, 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

20154OE74B

TESTING OF MATERIALS

**L T P C
3 0 0 3**

OBJECTIVE:

To understand the various destructive and non destructive testing methods of materials and its industrial applications.

UNIT I INTRODUCTION TO MATERIALS TESTING 9

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II MECHANICAL TESTING 9

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) -Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test -Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NON DESTRUCTIVE TESTING 9

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test –Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission-Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING 9

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques-Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING 9

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS

OUTCOMES:

- Identify suitable testing technique to inspect industrial component.
- Ability to use the different technique and know its applications and limitations.

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. Cullity, B. D., “Elements of X-ray diffraction”, 3rdEdition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, “The Mechanical Testing of Metals and Alloys” 7thEdition, Cousens Press, 2007.

REFERENCES:

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9thEdition, American Society for Metals, 1978.
2. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA, 1986.

20155OE74A

GREEN BUILDING DESIGN

L T P C
3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings-Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke.

20155OE74B

WASTE WATER TREATMENT

**L T P C
3 0 0 3**

OBJECTIVES:

- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic understandings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT 9

Water Quality-physical-chemical and biological parameters of water-water quality requirement -potable water standards -wastewater effluent standards -water quality indices. Water purification systems in natural systems-physical processes-chemical processes and biological processes-primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification -sedimentation; Types; aeration and gas transfer –coagulation and flocculation, coagulation processes -stability of colloids -destabilization of colloids-transport of colloidal particles, clariflocculation.

UNIT II INDUSTRIAL WATER TREATMENT 9

Filtration –size and shape characteristics of filtering media –sand filters hydraulics of filtration –design considerations –radial, upflow, highrate and multimedia filters, pressure filter. Water softening –lime soda, zeolite and demineralization processes –industrial water treatment for boilers.

UNIT III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control –adsorption –activated carbon treatment –removal of color –iron and manganese removal –aeration, oxidation, ion exchange and other methods –effects of fluorides –fluoridation and defluoridation –desalination -corrosion prevention and control –factors influencing corrosion –Langelier index –corrosion control measures.

UNIT IV WASTEWATER TREATMENT 9

Wastewater treatment –pre and primary treatment –equalization neutralization –screening and grid removal –sedimentation –oil separation gas stripping of volatile organics –biological oxidation –lagoons and stabilization basins –aerated lagoons –activated sludge process –trickling filtration –anaerobic decomposition.

UNIT V ADSORPTION AND OXIDATION PROCESSES 9

Chemical process –adsorption –theory of adsorption –ion exchange process –chemical oxidation –advanced oxidation process –sludge handling and disposal –miscellaneous treatment processes.

TOTAL: 45 PERIODS

OUTCOMES:

- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:

1. Metcalf and Eddy, “Wastewater Engineering”, 4thed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., “Industrial Water Pollution Control”, 2ndEdn., McGraw Hill Inc., 1989.

REFERENCES:

1. S.P. Mahajan, “Pollution control in process industries”, 27thEd. Tata McGraw Hill Publishing Company Ltd.,2012.
2. M. Lancaster, “Green Chemistry: An Introductory Text”, 2ndedition, RSC publishing, 2010.
3. C.S. Rao, “Environmental Pollution Control Engineering”, New Age International, 2007.

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ADHOC AND WIRELESS SENSOR NETWORKS

L T P C
3 0 0 3**OBJECTIVES:**

- Learn Ad hoc network and Sensor Network fundamentals
- Understand the different routing protocols
- Have an in-depth knowledge on sensor network architecture and design issues
- Understand the transport layer and security issues possible in Ad hoc and Sensor networks
- Have an exposure to mote programming platforms and tools

UNIT I AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS 9

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols - Destination Sequenced Distance Vector (DSDV), On-Demand Routing protocols –Ad hoc On-Demand Distance Vector Routing (AODV).

UNIT II SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES 9

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

UNIT III WSN NETWORKING CONCEPTS AND PROTOCOLS 9

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols-Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT IV SENSOR NETWORK SECURITY 9

Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the student would be able to:**

- Know the basics of Ad hoc networks and Wireless Sensor Networks
- Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement
- Apply the knowledge to identify appropriate physical and MAC layer protocols
- Understand the transport layer and security issues possible in Ad hoc and sensor networks.
- Be familiar with the OS used in Wireless Sensor Networks and build basic modules

TEXT BOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, —Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, 2004. (UNIT I)
2. Holger Karl , Andreas willig, —Protocol and Architecture for Wireless Sensor Networks, John wiley publication, Jan 2006.(UNIT II-V)

REFERENCES:

1. Feng Zhao, Leonidas Guibas, —Wireless Sensor Networks: an information processing approach, Elsevier publication, 2004.
2. Charles E. Perkins, —Ad Hoc Networking, Addison Wesley, 2000.
3. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, —Wireless sensor networks: a survey, computer networks, Elsevier, 2002, 394 - 422.

LIST OF ELECTIVES

ELECTIVE – III (SEMESTER VII)

ELECTIVE – III
SEMESTER VII

20152E76A

ADVANCED WIRELESS COMMUNICATION

L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the importance of improving capacity of wireless channel using MIMO
- To enable understanding of channel impairment mitigation using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

UNIT I CAPACITY OF WIRELESS CHANNELS

9

The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known at the TX, Channel unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

UNIT II RADIO WAVE PROPAGATION

9

Radio wave propagation – Macroscopic fading- free space and out door, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III SPACE TIME BLOCK CODES

9

Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation - decoding of STBC.

UNIT IV SPACE TIME TRELIS CODES

9

Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT V LAYERED SPACE TIME CODES

9

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx- MMSE V-blast Rx, Iterative Rx - capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

TOTAL: 45 PERIODS

OUTCOMES:

The student should be able to:

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply the knowledge about the importance of MIMO in today's communication
- Appreciate the various methods for improving the data rate of wireless communication system

REFERENCES:

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London. www.artech house.com, ISBN 1-58053-865-7-2004
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2003.
3. David Tse and Pramod Viswanath, —Fundamentals of Wireless Communication, Cambridge University Press, 2005.
4. Sergio Verdu — Multi User Detection, Cambridge University Press, 1998.

20152E76B

COGNITIVE RADIO

L T P C
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the evolving software defined radio and cognitive radio techniques and their essential functionalities
- To study the basic architecture and standard for cognitive radio
- To understand the physical, MAC and Network layer design of cognitive radio
- To expose the student to evolving applications and advanced features of cognitive radio

UNIT II COGNITIVE RADIO ARCHITECTURE

9

Cognition cycle – orient, plan, decide and act phases, Organization, SDR as a platform for Cognitive Radio – Hardware and Software Architectures, Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

UNIT III SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS

9

Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection and other approaches, Fundamental Tradeoffs in spectrum sensing, Spectrum Sharing Models of Dynamic Spectrum Access - Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

UNIT IV MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO

9

MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA, Network layer design – routing in cognitive radios, flow control and error control techniques.

UNIT V ADVANCED TOPICS IN COGNITIVE RADIO

9

Overview of security issues in cognitive radios, auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, cognitive radio for Internet of Things.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Gain knowledge on the design principles on software defined radio and cognitive radio
- Develop the ability to design and implement algorithms for cognitive radio spectrum sensing and dynamic spectrum access
- Build experiments and projects with real time wireless applications
- Apply the knowledge of advanced features of cognitive radio for real world applications

TEXT BOOKS:

1. Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, —Cognitive Radio Communications and Networks, Academic Press, Elsevier, 2010. (Unit I to IV)
2. Huseyin Arslan (Ed.), —Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems, Springer, 2007. (Unit V)

REFERENCES:

1. Bruce Fette, —Cognitive Radio Technology, Newnes, 2006.
2. Kwang-Cheng Chen, Ramjee Prasad, — Cognitive Radio Networks, John Wiley and Sons, 2009.
3. Ezio Biglieri, Professor Andrea J. Goldsmith, Dr Larry J. Greenstein, Narayan B. Mandayam, H. Vincent Poor, —Principles of Cognitive Radiol , Cambridge University Press, 2012.

20152E76C FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

L T P C
3 0 0 3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - **Introduction to Product Development Methodologies and Management** - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering – traceability Matrix and Analysis - Requirement Management - **System Design & Modeling** - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines** - Concept Screening & Evaluation - **Detailed Design** - Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping** - Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance** - Maintenance and Repair – Enhancements - **Product EoL** - Obsolescence Management – Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia – **The IPD Essentials** - Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.

REFERENCES:

1. Hiriappa B, —Corporate Strategy – Managing the Business, Author House, 2013.
2. Peter F Drucker, —People and Performance, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, —Enterprise Resource Planning – Concepts, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

20152E76D

MACHINE LEARNING TECHNIQUES

**L T P C
3 0 0 3**

OBJECTIVES:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To learn the new approaches in machine learning
- To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION 9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING 9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT V ADVANCED LEARNING 9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be able to

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Apply specific supervised or unsupervised machine learning algorithm for a particular problem
- Analyse and suggest the appropriate machine learning approach for the various types of problem
- Design and make modifications to existing machine learning algorithms to suit an individual application
- Provide useful case studies on the advanced machine learning algorithms

TEXT BOOK:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

20152E76E

ELECTRONICS PACKAGING AND TESTING

**L T P C
3 0 0 3**

OBJECTIVE:

- To introduce and discuss various issues related to the system packaging

UNIT I OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING 9

Functions of an Electronic Package, Packaging Hierarchy, IC packaging: MEMS packaging, consumer electronics packaging, medical electronics packaging, Trends, Challenges, Driving Forces on Packaging Technology, Materials for Microelectronic packaging, Packaging Material Properties, Ceramics, Polymers, and Metals in Packaging, Material for high density interconnect substrates

UNIT II ELECTRICAL ISSUES IN PACKAGING 9

Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution, Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digital and RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance and Inductance fundamentals; Packaging roadmaps - Hybrid circuits - Resistive, Capacitive and Inductive parasitics

UNIT III CHIP PACKAGES 9

IC Assembly - Purpose, Requirements, Technologies, Wire bonding, Tape Automated Bonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Single chip packaging: functions, types, materials processes, properties, characteristics, trends. Multi chip packaging: types, design, comparison, trends. System – in - package (SIP); Passives: discrete, integrated, and embedded

UNIT IV PCB, SURFACE MOUNT TECHNOLOGY AND THERMAL CONSIDERATIONS 9

Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Micro via Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges. Thermal Management, Heat transfer fundamentals, Thermal conductivity and resistance, Conduction, convection and radiation – Cooling requirements

UNIT V TESTING 9

Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue – failures – thermo mechanically induced – electrically induced – chemically induced. Electrical Testing: System level electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Give a comprehensive introduction to the various packaging types used along with the associated thermal, speed, signal and integrity power issues
- Enable design of packages which can withstand higher temperature, vibrations and shock
- Design of PCBs which minimize the EMI and operate at higher frequency
- Analyze the concepts of Testing and testing methods

TEXT BOOK:

1. Tummala, Rao R., Fundamentals of Microsystems Packaging, McGraw Hill, 2001

REFERENCES:

1. Blackwell (Ed), The electronic packaging handbook, CRC Press, 2000.
2. Tummala, Rao R, Microelectronics packaging handbook, McGraw Hill, 2008.
3. Bosshart, Printed Circuit Boards Design and Technology, TataMcGraw Hill, 1988.
4. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011

5. R.S.Khandpur, Printed Circuit Board, Tata McGraw Hill, 2005
6. Recent literature in Electronic Packaging
7. Michael L. Bushnell & Vishwani D. Agrawal, || Essentials of Electronic Testing for Digital, memory & Mixed signal VLSI Circuits||, Kluwer Academic Publishers.2000.
8. M. Abramovici, M. A. Breuer, and A.D. Friedman, —Digital System Testing and Testable Design||, Computer Science Press,1990

20152E76F

MIXED SIGNAL IC DESIGN

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made to:

- Study the mixed signal of submicron CMOS circuits
- Understand the various integrated based filters and topologies
- Learn the data converters architecture, modeling and signal to noise ratio
- Study the integrated circuit of oscillators and PLLs

UNIT I SUBMICRON CMOS CIRCUIT DESIGN 9

Submicron CMOS: Overview and Models, CMOS process flow, Capacitors and Resistors. Digital circuit design: The MOSFET Switch, Delay Elements, An Adder. Analog Circuit Design: Biasing, Op-Amp Design, Circuit Noise.

UNIT II INTEGRATOR BASED CMOS FILTERS 9

Integrator Building Blocks- low pass filter, Active RC integrators, MOSFET-C Integrators, g_m -C integrators, Discrete time integrators. Filtering Topologies: The Bilinear transfer function, The Biquadratic transfer function, Filters using Noise shaping.

UNIT III DATA CONVERTER ARCHITECTURES 9

DAC Architectures- Resistor string, R-2R ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, and Pipeline DAC. ADC Architectures- Flash, Two-step flash ADC, Pipeline ADC, Integrating ADC's, Successive Approximation ADC.

UNIT IV DATA CONVERTER MODELING AND SNR 9

Sampling and Aliasing: A modeling approach, Impulse sampling, The sample and Hold, Quantization noise. Data converter SNR: An overview, Clock Jitter, Improving SNR using Averaging, Decimating filter for ADCs, Interpolating filter for DACs, Band pass and High pass sinc filters - Using feedback to improve SNR.

UNIT V OSCILLATORS AND PLL 9

LC oscillators, Voltage Controlled Oscillators. Simple PLL, Charge pumps PLLs, Non ideal effects in PLLs, Delay Locked Loops.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, student should be able to

- Apply the concepts for mixed signal MOS circuit.
- Analyze the characteristics of IC based CMOS filters.
- Design of various data converter architecture circuits.
- Analyze the signal to noise ratio and modeling of mixed signals.
- Design of oscillators and phase lock loop circuit.

REFERENCES:

1. CMOS Mixed Signal Circuit Design by R.Jacob Baker, Wiley India, IEEE Press, reprint 2008.
2. CMOS Circuit Design, Layout and Simulation by R.Jacob Baker, Wiley India, IEEE Press, Second Edition, reprint 2009.
3. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 33rd Re-print, 2016.

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. —Disaster Managementll, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, —Disaster Science and Managementll, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

20152L77

EMBEDDED LABORATORY

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OBJECTIVES:**The student should be made to:**

- Learn the working of ARM processor
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

LIST OF EXPERIMENTS:

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the student should be able to:**

- Write programs in ARM for a specific Application
- Interface memory, A/D and D/A convertors with ARM system
- Analyze the performance of interrupt
- Write program for interfacing keyboard, display, motor and sensor.
- Formulate a mini project using embedded system

OBJECTIVES:**The student should be made to:**

- Understand the working principle of optical sources, detector, fibers
- Develop understanding of simple optical communication link
- Understand the measurement of BER, Pulse broadening
- Understand and capture an experimental approach to digital wireless communication
- Understand actual communication waveforms that will be sent and received across wireless channel

LIST OF OPTICAL EXPERIMENTS

1. Measurement of connector, bending and fiber attenuation losses.
2. Numerical Aperture and Mode Characteristics of Fibers.
3. DC Characteristics of LED and PIN Photo diode.
4. Fiber optic Analog and Digital Link Characterization - frequency response(analog), eye diagram and BER (digital)

LIST OF WIRELESS COMMUNICATION EXPERIMENTS

1. Wireless Channel Simulation including fading and Doppler effects
2. Simulation of Channel Estimation, Synchronization & Equalization techniques
3. Analysing Impact of Pulse Shaping and Matched Filtering using Software Defined Radios
4. OFDM Signal Transmission and Reception using Software Defined Radios

LIST OF MICROWAVE EXPERIMENTS

1. VSWR and Impedance Measurement and Impedance Matching
2. Characterization of Directional Couplers, Isolators, Circulators
3. Gunn Diode Characteristics
4. Microwave IC – Filter Characteristics

TOTAL: 60 PERIODS**OUTCOMES:****On completion of this lab course, the student would be able to**

- Analyze the performance of simple optical link by measurement of losses and Analyzing the mode characteristics of fiber
- Analyze the Eye Pattern, Pulse broadening of optical fiber and the impact on BER
- Estimate the Wireless Channel Characteristics and Analyze the performance of Wireless Communication System
- Understand the intricacies in Microwave System design

REFERENCES:

1. C.R.Paul,||Introduction to Electromagnetic Compatibility| , John Wiley and Sons, Inc, 1992.
2. Bemhard Keiser, —Principles of Electromagnetic Compatibility|, 3rd Ed, Artech house, Norwood, 1986.
3. Don R. J.White Consultant Incorporate, —Handbook of EMI/EMCl, Vol I-V, 1988.

20152E81B

LOW POWER SoC DESIGN

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made to:

- Identify sources of power in an IC.
- Understand basic principle of System on Chip design
- Learn optimization of power in combinational and sequential logic machines for SoC Design
- Identify suitable techniques to reduce the power dissipation and design circuits with low power dissipation.

UNIT I POWER CONSUMPTION IN CMOS 9

Physics of power dissipation in CMOS FET devices – Hierarchy of limits of power – Sources of power consumption – Static Power Dissipation, Active Power Dissipation - Designing for Low Power, Circuit Techniques for Leakage Power Reduction - Basic principle of low power design, Logic level power optimization – Circuit level low power design.

UNIT II SYSTEM-ON-CHIP DESIGN 9

System-on-Chip Concept, Design Principles in SoC Architecture, SoC Design Flow, Platform-based and IP based SoC Designs, Basic Concepts of Bus-Based Communication Architectures. High performance algorithms for ASICs/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC

UNIT III POWER OPTIMIZATION OF COMBINATIONAL AND SEQUENTIAL LOGIC MACHINES FOR SOC 9

Introduction to Standard Cell-Based Layout – Simulation - Combinational Network Delay - Logic and interconnect Design - Power Optimization - Switch Logic Networks. Introduction - Latches and Flip-Flops - Sequential Systems and Clocking Disciplines - Sequential System Design - Power Optimization - Design Validation - Sequential Testing.

UNIT IV DESIGN OF LOW POWER CIRCUITS FOR SUB SYSTEM ON A SOC 9

Subsystem Design Principles - Combinational Shifters – Adders – ALUs – Multipliers – High Density Memory – Field Programmable Gate Arrays - Programmable Logic Arrays - Computer arithmetic techniques for low power system – low voltage low power static Random access and dynamic Random access memories, low power clock, Inter connect and layout design

UNIT V FLOOR PLANNING 9

Floor-planning Methods – Block Placement & Channel Definition - Global Routing - switchbox Routing - Power Distribution - Clock Distributions - Floor-planning Tips - Design Validation - Off-Chip Connections – Packages, The I/O Architecture - PAD Design

TOTAL:45 PERIODS

OUTCOME:

At the end of the course, the student should be able to:

- Analyze and design low-power VLSI circuits using different circuit technologies for system on chip design

TEXT BOOKS:

1. J.Rabaey, —Low Power Design Essentials (Integrated Circuits and Systems)l, Springer, 2009
2. Wayne Wolf, —Modern VLSI Design – System – on – Chip Designl, Prentice Hall, 3rd Edition, 2008.

REFERENCES:

1. J.B.Kuo & J.H.Lou, —Low-voltage CMOS VLSI Circuitsl, Wiley, 1999.

2. A.Bellaowar & M.I.Elmasry,||Low power Digital VLSI Design, Circuits and Systems||, Kluwer, 1996.
3. Wayne Wolf, —Modern VLSI Design – IP based Design||, Prentice Hall, 4th Edition, 2008.
4. M.J.S. Smith : Application Specific Integrated Circuits, Pearson, 2003
5. Sudeep Pasricha and Nikil Dutt, On-Chip Communication Architectures System on Chip Interconnect, Elsevier, 2008
6. Recent literature in Low Power VLSI Circuits.
7. Recent literature in Design of ASICs

20152E81C

PHOTONIC NETWORKS

L T P C
3 0 0 3

OBJECTIVES:

- To enable the student to understand the importance of the backbone infrastructure for our present and future communication needs and familiarize them with the architectures and the protocol stack in use
- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue
- To expose the student to the advances in networking and switching domains and the future trends

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9

The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks, Logically Routed Networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student would be able to:

- Use the backbone infrastructure for our present and future communication needs
- Analyze the architectures and the protocol stack
- Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods, network management and protection methods in vogue

REFERENCES:

1. Rajiv Ramaswami and Kumar N. Sivarajan, —Optical Networks: A Practical Perspective, Harcourt Asia Pte Ltd., Second Edition 2004.
2. C. Siva Ram Moorthy and Mohan Gurusamy, —WDM Optical Networks: Concept, Design and Algorithms, Prentice Hall of India, 1st Edition, 2002.
3. P.E. Green, Jr., —Fiber Optic Networks, Prentice Hall, NJ, 1993.
4. Biswanath Mukherjee, —Optical WDM Networks, Springer Series, 2006.

20152E81D

COMPRESSIVE SENSING

**L T P C
3 0 0 3**

OBJECTIVES:

- To present the basic theory and ideas showing when it is possible to reconstruct sparse or nearly sparse signals from undersampled data
- To expose students to recent ideas in modern convex optimization allowing rapid signal recovery
- To give students a sense of real time applications that might benefit from compressive sensing ideas

UNIT II SPARSITY AND SIGNAL RECOVERY 9

Signal Representation; Basis vectors; Sensing matrices; Restricted Isometric Property; Coherence; Stable recovery; Number of measurements.

UNIT III RECOVERY ALGORITHMS 9

Basis Pursuit algorithm: L1 minimization; Matching pursuit: Orthogonal Matching Pursuit(OMP), Stagewise OMP, Regularized OMP, Compressive Sampling Matching Pursuit (CoSaMP); Iterative Thresholding algorithm: Hard thresholding, Soft thresholding; Model based : Model based CoSaMP, Model based HIT.

UNIT IV COMPRESSIVE SENSING FOR WSN 9

Basics of WSN; Wireless Sensor without Compressive Sensing; Wireless Sensor with Compressive Sensing; Compressive Wireless Sensing: Spatial compression in WSNs, Projections in WSNs, Compressed Sensing in WSNs.

UNIT V APPLICATIONS OF COMPRESSIVE SENSING 9

Compressed Sensing for Real-Time Energy-Efficient Compression on Wireless Body Sensor Nodes; Compressive sensing in video surveillance; An Application of Compressive Sensing for Image Fusion; Single-Pixel Imaging via Compressive Sampling.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Appreciate the motivation and the necessity for compressed sensing technology.
- Design a new algorithm or modify an existing algorithm for different application areas in wireless sensor network.

TEXT BOOKS:

1. Radha S, Hemalatha R, Aasha Nandhini S, —Compressive Sensing for Wireless Communication: Challenges and Opportunities, River publication, 2016. (UNIT I-V)
2. Mark A. Davenport, Marco F. Duarte, Yonina C. Eldar and Gitta Kutyniok, —Introduction to Compressed Sensing, in Compressed Sensing: Theory and Applications, Y. Eldar and G. Kutyniok, eds., Cambridge University Press, 2011 (UNIT I)

REFERENCES:

1. Duarte, M.F.; Davenport, M.A.; Takhar, D.; Laska, J.N.; Ting Sun; Kelly, K.F.; Baraniuk, R.G.; "Single-Pixel Imaging via Compressive Sampling," Signal Processing Magazine, IEEE, vol.25, no.2, pp.83-91, March 2008.

2. Tao Wan.; Zengchang Qin.; , —An application of compressive sensing for image fusionl, CIVR '10 Proceedings of the ACM International Conference on Image and Video Retrieval, Pages 3-9.
3. H. Mamaghanian , N. Khaled , D. Atienza and P. Vandergheynst "Compressed sensing for real-time energy-efficient ecg compression on wireless body sensor nodes", IEEE Trans. Biomed. Eng., vol. 58, no. 9, pp.2456 -2466 2011.
4. Mohammadreza Balouchestani.; Kaamran Raahemifar.; and Sridhar Krishnan.,, —COMPRESSED SENSING IN WIRELESS SENSOR NETWORKS: SURVEYI , Canadian Journal on Multimedia and Wireless Networks Vol. 2, No. 1, February 2011.

20152E81E

DIGITAL IMAGE PROCESSING

**L T P C
3 0 0 3**

OBJECTIVES:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

**TOTAL: 45
PERIODS**

OUTCOMES:

At the end of the course, the students should be able to:

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Understand the restoration concepts and filtering techniques.
- Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, ‘Digital Image Processing’, Pearson, Third Edition, 2010.
2. Anil K. Jain, ‘Fundamentals of Digital Image Processing’, Pearson, 2002.

REFERENCES

1. Kenneth R. Castleman, *‘Digital Image Processing’*, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, *‘Digital Image Processing using MATLAB’*, Pearson Education, Inc., 2011.
3. D.E. Dudgeon and R.M. Mersereau, *‘Multidimensional Digital Signal Processing’*, Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, *‘Digital Image Processing’*, John Wiley, New York, 2002
5. Milan Sonka et al *‘Image processing, analysis and machine vision’*, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

LIST OF ELECTIVES

ELECTIVE – V (SEMESTER VIII)

ELECTIVE – V
SEMESTER VIII

20152E82A VIDEO ANALYTICS

L T P C
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the need for video Analytics
- To understand the basic configuration of video analytics
- To understand the functional blocks of a video analytic system
- To get exposed to the various applications of video analytics

UNIT I VIDEO ANALYTIC COMPONENTS 9

Need for Video Analytics-Overview of video Analytics- Foreground extraction- Feature extraction classifier - Preprocessing- edge detection- smoothening- Feature space-PCA-FLD-SIFT features

UNIT II FOREGROUND EXTRACTION 9

Background estimation- Averaging- Gaussian Mixture Model- Optical Flow based- Image Segmentation- Region growing- Region splitting-Morphological operations- erosion-Dilation-Tracking in a multiple camera environment

UNIT III CLASSIFIERS 9

Neural networks (back propagation) - Deep learning networks- Fuzzy Classifier- Bayesian classifier-HMM based classifier

UNIT IV VIDEO ANALYTICS FOR SECURITY 9

Abandoned object detection- human behavioral analysis -human action recognition -perimeter security - crowd analysis and prediction of crowd congestion

UNIT V VIDEO ANALYTICS FOR BUSINESS INTELLIGENCE & TRAFFIC MONITORING AND ASSISTANCE 9

Customer behavior analysis - people counting- Traffic rule violation detection- traffic congestion identification for route planning- driver assistance- lane change warning

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design video analytic algorithms for security applications
- Design video analytic algorithms for business intelligence
- Design custom made video analytics system for the given target application

REFERENCES:

1. Graeme A. Jones (Editor), Nikos Paragios (Editor), Carlo S. Regazzoni (Editor) Video-Based Surveillance Systems: Computer Vision and Distributed Processing, Kluwer academic publisher, 2001
2. Nilanjan Dey (Editor), Amira Ashour (Editor) and Suvojit Acharjee (Editor), Applied Video Processing in Surveillance and Monitoring Systems (IGI global) 2016

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

3. Zhihao Chen (Author), Ye Yang (Author), Jingyu Xue (Author), Liping Ye (Author), Feng Guo (Author), The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite, CreateSpace Independent Publishing Platform, 2014
4. Caifeng Shan (Editor), Fatih Porikli (Editor), Tao Xiang (Editor), Shaogang Gong (Editor) Video Analytics for Business Intelligence, Springer, 2012

20152E82B

DSP ARCHITECTURE AND PROGRAMMING

**L T P C
3 0 0 3**

OBJECTIVES:

The objective of this course is to provide knowledge on:

- Basics on Digital Signal Processors
- Programmable DSP's Architecture, On-chip Peripherals and Instruction set
- Programming for signal processing applications
- Advanced Programmable DSP Processors

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

Introduction to Programmable DSPs, Architectural Features of PDSPs - Multiplier and Multiplier accumulator – Modified Bus Structures and Memory access – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals, Applications of Programmable DSPs.

UNIT II TMS320C5X PROCESSOR 9

Architecture of C5X Processor – Addressing modes – Assembly language Instructions - Pipeline structure, On-chip Peripherals – Block Diagram of DSP starter kit (DSK) – Software Tools, DSK on-board peripherals, Application Programs for processing real time signals.

UNIT III TMS320C6X PROCESSOR 9

Architecture of the C6x Processor - Instruction Set – Addressing modes, Assembler directives, On-chip peripherals, DSP Development System: DSP Starter Kit - Code Composer Studio - Support Files – Introduction to AIC23 codec and other on-board peripherals, Real-Time Programming Examples for Signals and Noise generation, Frequency analysis, Filter design.

UNIT IV ADSP PROCESSORS 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT V ADVANCED PROCESSORS 9

Study of TI's advanced processors - TMS320C674x and TMS320C55x DSPs, ADSP's Blackfin and SigmaDSP Processors, NXP's DSP56Fxx Family of DSP Processors, Comparison of the features of TI, ADSP and NXP DSP family processors.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the concepts of Digital Signal Processors
- Demonstrate their ability to program the DSP processor for signal processing applications
- Discuss, compare and select the suitable Advanced DSP Processors for real-time signal processing applications

REFERENCES:

1. B. Venkataramani and M. Bhaskar, —Digital Signal Processors – Architecture, Programming and Applications— Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. Avtar Singh and S. Srinivasan, Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx, Cengage Learning India Private Limited, Delhi 2012.

3. Rulph Chassaing and Donald Reay, Digital Signal Processing and Applications with the C6713 and C6416 DSK, John Wiley & Sons, Inc., Publication, 2012 (Reprint).
4. User guides Texas Instruments, Analog Devices and NXP.

20152E82C

SATELLITE COMMUNICATION

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made to:

- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

UNIT I SATELLITE ORBITS

9

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT

9

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III SATELLITE LINK DESIGN

9

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV SATELLITE ACCESS AND CODING METHODS

9

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

UNIT V SATELLITE APPLICATIONS

9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student would be able to:

- Analyze the satellite orbits
- Analyze the earth segment and space segment
- Analyze the satellite Link design
- Design various satellite applications

TEXT BOOKS:

1. Dennis Roddy, —Satellite Communication, 4th Edition, Mc Graw Hill International, 2006.
2. Timothy,Pratt,Charles,W.Bostain,JeremyE.Allnutt,"SatelliteCommunication, 2nd Edition, Wiley Publications, 2002

REFERENCES:

1. Wilbur L.Pritchard, Hendri G. Snyderhoud, Robert A. Nelson, —Satellite Communication Systems Engineering, Prentice Hall/Pearson, 2007.
2. N.Agarwal, —Design of Geosynchronous Space Craft, Prentice Hall, 1986.

3. Bruce R. Elbert, —The Satellite Communication Applications, Hand Book, Artech House Boston London, 1997.
4. Tri T. Ha, —Digital Satellite Communication, II nd edition, 1990.
5. Emanuel Fthenakis, —Manual of Satellite Communications, Mc Graw Hill Book Co., 1984.
6. Robert G. Winch, —Telecommunication Trans Mission Systems, Mc Graw-Hill Book Co., 1983.
7. Brian Ackroyd, —World Satellite Communication and earth station Design, BSP Professional Books, 1990.
8. G.B.Bleazard, —Introducing Satellite communications—, NCC Publication, 1985.
9. M.Richharia, —Satellite Communication Systems-Design Principles, Macmillan 2003.

20152E82D

SOFT COMPUTING

**L T P C
3 0 0 3**

OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS 9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV GENETIC ALGORITHMS 9

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V HYBRID SYSTEMS 9

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to

- Apply suitable soft computing techniques for various applications.
- Integrate various soft computing techniques for complex problems.

TEXT BOOKS:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, —Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2002.
2. Kwang H.Lee, —First course on Fuzzy Theory and Applications, Springer, 2005.
3. George J. Klir and Bo Yuan, —Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

20152E82E

PRINCIPLES OF SPEECH PROCESSING

**L T P C
3 0 0 3**

OBJECTIVES:

The student should be made:

- To understand the speech production mechanism and the various speech analysis techniques and speech models
- To understand the speech compression techniques
- To understand the speech recognition techniques
- To know the speaker recognition and text to speech synthesis techniques

UNIT I SPEECH SIGNAL CHARACTERISTICS & ANALYSIS 11

Speech production process - speech sounds and features- - Phonetic Representation of Speech -- representing= speech in time and frequency domains - Short-Time Analysis of Speech - Short-Time Energy and Zero-Crossing Rate - Short-Time Autocorrelation Function - Short-Time Fourier Transform (STFT) - Speech Spectrum - Cepstrum - Mel-Frequency Cepstrum Coefficients - Hearing and Auditory Perception - Perception of Loudness - Critical Bands - Pitch Perception

UNIT II SPEECH COMPRESSION 12

Sampling and Quantization of Speech Vector Quantization- (PCM) - Adaptive differential PCM - Delta Modulation -Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT III SPEECH RECOGNITION 12

LPC for speech recognition- Hidden Markov Model (HMM)- training procedure for HMM- subword unit model based on HMM- language models for large vocabulary speech recognition - Overall recognition system based on subword units - Context dependent subword units- Semantic post processor for speech recognition

UNIT IV SPEAKER RECOGNITION 5

Acoustic parameters for speaker verification- Feature space for speaker recognition-similarity measures- Text dependent speaker verification-Text independent speaker verification techniques

UNIT V SPEAKER RECOGNITION AND TEXT TO SPEECH SYNTHESIS 5

Text to speech synthesis(TTS)-Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design speech compression techniques
- Configure speech recognition techniques
- Design speaker recognition systems
- Design text to speech synthesis systems

TEXT BOOKS:

1. L. R. Rabiner and R. W. Schafer, Introduction to Digital Signal Processing, Foundations and Trends in Signal Processing Vol. 1, Nos. 1–2 (2007) 1–194
2. Ben Gold and Nelson Morgan —Speech and Audio signal processing- processing and perception of speech and music, John Wiley and sons 2006

REFERENCES

1. Lawrence Rabiner, Biiing and– Hwang Juang and B.Yegnanarayana —Fundamentals of Speech Recognition, Pearson Education, 2009

2. Claudio Becchetti and Lucio Prina Ricotti, —Speech Recognitionl, John Wiley and Sons, 1999
3. Donglos O shanhnessy —Speech Communication: Human and Machine —, 2nd Ed. University press 2001.

20152E82F

FUNDAMENTALS OF NANO SCIENCE

**L T P C
3 0 0 3**

OBJECTIVE:

- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION 8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thin films-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications-Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, Nano alumina, CaO, AgTiO₂, Ferrites, Nano clays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS 7

Nano InfoTech: Information storage- Nano computer, molecular switch, super chip, nanocrystal, Nano biotechnology: nanoprobe in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sun barrier products - In Photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS

OUTCOMES:

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., —Nanomaterials: Synthesis, Properties and Applications, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, —Nanoscale Characterization of surfaces & Interfaces, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, —Nanotechnology, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia,—The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR)– Discrimination.

UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

- 1 Mike W. Martin and Roland Schinzinger, — Ethics in Engineeringl, Tata McGraw Hill, New Delhi, 2003.
- 2 Govindarajan M, Natarajan S, Senthil Kumar V. S, — Engineering Ethicsl, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

- 1 Charles B. Fleddermann, —Engineering Ethicsl, Pearson Prentice Hall, New Jersey, 2004.
- 2 Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Casesl, Cengage Learning, 2009.
- 3 John R Boatright, —Ethics and the Conduct of Businessl, Pearson Education, New Delhi, 2003
- 4 Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineersl, Oxford University Press, Oxford, 2001.
- 5 Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibilityl Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
- 6 World Community Service Centre, ‘_ Value Education’, Vethathiri publications, Erode, 2011.

Web sources:

www.onlineethics.org www.nspe.org www.globlethics.org www.ethics.org



PRIST DEEMED UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

**DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING**

PROGRAM HANDBOOK

B.TECH FULL TIME

[REGULATION 2017]

[for candidates admitted to B.Tech EEE program from June 2017 onwards]

PROGRAMME EDUCATIONAL OBJECTIVES:

- PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.
- PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.
- PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

- A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- B. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- C. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- D. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- E. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- F. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- G. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- H. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- I. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- J. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- K. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- L. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH
PROGRAMME OUTCOMES**

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMM OUTCOMES												
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	3	2	3	2	1	1	2	1	1	3	1	3
2	3	3	3	3	3	1	1	1	1	1	1	2	2
3	3	3	3	3	3	2	2	3	1	2	2	2	2

1-Reasonable: 2- Significant: 3- Strong

COURSE STRUCTURE

B.TECH-EEE
R 2017

SEMESTER I

S.No	Course Code	Course Title	L	T	P	C
1	17147S11	Communicative English	5	1	0	4
2	17148S12	Engineering Mathematics - I	5	1	0	4
3	17149S13	Engineering Physics	5	1	0	4
4	17149S14	Engineering Chemistry	5	1	0	4
5	17154S15	Engineering Graphics	5	1	0	4
6	17150S16	Problem Solving and Python programming	5	1	0	4
7	17150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	17149L18	Physics and Chemistry Laboratory	0	0	3	2
9	171VEA19	Value Education				1
TOTAL CREDITS						29

SEMESTER – II

S.No	Course Code	Course Name	L	T	P	C
1	17147S21	Technical English	5	1	0	4
2	17148S22A	Engineering Mathematics - II	5	1	0	4
3	17149S23B	Physics for Electronics Engineering	5	1	0	4
4	17149S24A	Environmental Science and Engineering	5	1	0	4
5	17153S25C	Circuit Theory	5	1	0	4
6	17154S26C	Basic Civil and Mechanical Engineering	5	1	0	4
7	17154L27	Engineering Practices Laboratory	0	0	3	2
8	17153L28C	Electric Circuits Laboratory	0	0	3	2
9	171ICA29	Fundamentals of Indian Constitution and Economy				1
TOTAL CREDITS						29

SEMESTER I

SEMESTER III

S.No	Course Code	Course Name	L	T	P	C
1	17149S31C	Transforms and Partial Differential Equations	3	1	0	4
2	17153C32	Digital Logic Circuits	3	1	0	3
3	17153C33	Electromagnetic Theory	2	2	0	3
4	17153C34	Electrical Machines - I	2	2	0	3
5	17153C35	Electron Devices and Circuits	3	0	0	3
6	17153C36	Power Plant Engineering	3	0	0	3
7	17153L37	Electronics Laboratory	0	0	3	2
8	17153L38	Electrical Machines Laboratory - I	0	0	3	2
TOTAL CREDITS						23

SEMESTER IV

S.No	Course Code	Course Name	L	T	P	C
1	17149C41C	Numerical Methods	4	0	0	4
2	17153C42	Electrical Machines - II	2	2	0	3
3	17153C43	Transmission and Distribution	3	0	0	3
4	17153C44	Measurements and Instrumentation	3	0	0	3
5	17153C45	Linear Integrated Circuits and Applications	3	0	0	3
6	17153C46	Control Systems	3	2	0	4
7	17153L47	Electrical Machines Laboratory - II	0	0	4	2
8	17153L48	Linear and Digital Integrated Circuits Laboratory	0	0	4	2
9	17153L49	Technical Seminar	0	0	2	1
10	17153CRS	Research Led Seminar	0	0	0	1
TOTAL CREDITS						26

SEMESTER – V

S.No	Course Code	Course Name	L	T	P	C
1	17153C51	Power System Analysis	3	0	0	3
2	17153C52	Microprocessors and Microcontrollers	3	0	0	3
3	17153C53	Power Electronics	3	0	0	3
4	17153FE54_	Free Elective - I*	3	0	0	3
5	17153C55	Digital Signal Processing	2	2	0	3
6	17153C56	Object Oriented Programming	3	0	0	3
7	17153L57	Control and Instrumentation Laboratory	0	0	3	2
8	17153L58	Object Oriented Programming Laboratory	0	0	3	2
9	17153L59	Professional Communication	0	0	2	1
10	17153CRM	Research Methodology	3	0	0	3
TOTAL CREDITS						26

SEMESTER – VI

S.No	Course Code	Course Name	L	T	P	C
1	17153C61	Solid State Drives	3	0	0	3
2	17153C62	Protection and Switchgear	3	0	0	3
3	17153C63	Embedded Systems	3	0	0	3
4	17153E64_	Elective - I	3	0	0	3
5	17153E65__	Elective - II	3	0	0	3
6	17153L66	Power Electronics and Drives Laboratory	0	0	3	2
7	17153L67	Microprocessors and Microcontrollers Laboratory	0	0	3	2
8	17153MP68	Mini Project	0	0	4	2
9	17153CBR	Participation in Bounded Research	0	0	0	2
TOTAL CREDITS						23

SEMESTER – VII

S.No	Course Code	Course Name	L	T	P	C
1	17153C71	High Voltage Engineering	3	0	0	3
2	17153C72	Power System Operation and Control	3	0	0	3
3	17153C73	Renewable Energy Systems	3	0	0	3
4	17153FE74_	Free Elective -II	3	0	0	3
5	17153E75_	Elective - III	3	0	0	3
6	17153E76_	Elective - IV	3	0	0	3
7	17153L77	Power System Simulation Laboratory	0	0	3	2
8	17153L78	Renewable Energy Systems Laboratory	0	0	3	2
9	17153CSR	Participation in Scaffolded Research (Design / Socio Technical Project)	0	0	0	4
TOTAL CREDITS						26

SEMESTER – VIII

S.No	Course Code	Course Name	L	T	P	C
1.	17153E81_	Elective - V	3	0	0	3
2.	17153E82_	Elective - VI	3	0	0	3
3.	17153P81	Project Work	-	-	-	12
4.	17153CEC	Comprehensive Exit Course				2
TOTAL CREDITS						20

*Course from the curriculum of other UG Programmes

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LIST OF ELECTIVES

ELECTIVE – I (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	17153E64A	Advanced Control System	2	2	0	3
2.	17153E64B	Visual Languages and Applications	3	0	0	3
3.	17153E64C	Design of Electrical Apparatus	3	0	0	3
4.	17153E64D	Power Systems Stability	3	0	0	3
5.	17153E64E	Modern Power Converters	3	0	0	3
6.	17153E64F	Intellectual Property Rights	3	0	0	3

ELECTIVE – II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	17153E65A	Principles of Robotics	3	0	0	3
2.	17153E65B	Special Electrical Machines	3	0	0	3
3.	17153E65C	Power Quality	3	0	0	3
4.	17153E65D	EHVAC Transmission	3	0	0	3
5.	17153E65E	Communication Engineering	3	0	0	3

ELECTIVE – III (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	17153E75A	Disaster Management	3	0	0	3
2	17153E75B	Human Rights	3	0	0	3
3	17153E75C	Operations Research	3	0	0	3
4	17153E75D	Probability and Statistics	3	0	0	3
5	17153E75E	Fiber Optics and Laser Instrumentation	3	0	0	3

ELECTIVE – IV (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	17153E76A	System Identification and Adaptive Control	3	0	0	3
2	17153E76B	Computer Architecture	3	0	0	3
3	17153E76C	Control of Electrical Drives	3	0	0	3
4	17153E76D	VLSI Design	3	0	0	3
5	17153E76E	Power Systems Transients	3	0	0	3
6	17153E76F	Total Quality Management	3	0	0	3

ELECTIVE – V (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	17153E81A	Flexible AC Transmission Systems	3	0	0	3
2	17153E81B	Soft Computing Techniques	3	0	0	3
3	17153E81C	Power Systems Dynamics	3	0	0	3
4	17153E81D	SMPS and UPS	3	0	0	3
5	17153E81E	Electric Energy Generation, Utilization and Conservation	3	0	0	3
6	17153E81F	Professional Ethics in Engineering	3	0	0	3
7	17153E81G	Principles of Management	3	0	0	3

ELECTIVE – VI (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	17153E82A	Energy Management and Auditing	3	0	0	3
2	17153E82B	Data Structures	3	0	0	3
3	17153E82C	High Voltage Direct Current Transmission	3	0	0	3
4	17153E82D	Microcontroller Based System Design	3	0	0	3
5	17153E82E	Smart Grid	3	0	0	3
6	17153E82F	Biomedical Instrumentation	3	0	0	3
7	17153E82G	Fundamentals of Nano Science	3	0	0	3

FREE ELECTIVE (V SEM)

S.No	Course Code	Course Name	L	T	P	C
1	17150FE54A	Database Management System	3	0	0	3
2	17152FE54A	Basics of Biomedical Instrumentation	3	0	0	3
3	17154FE54A	Renewable Energy Sources	3	0	0	3
4	17155FE54A	Air Pollution and Control Engineering	3	0	0	3
5	17150FE54B	Cloud computing	3	0	0	3
6	17152FE54B	Sensors and Transducers	3	0	0	3
7	17154FE54B	Automatic System	3	0	0	3
8	17155FE54B	Geographic Information System	3	0	0	3

FREE ELECTIVE (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	17150FE74A	Introduction to C Programming	3	0	0	3
2	17152FE74A	Robotics	3	0	0	3
3	17154FE74A	Industrial safety	3	0	0	3
4	17155FE74A	Green Building Design	3	0	0	3
5	17150FE74B	Datastructures and Algorithms	3	0	0	3
6	17152FE74B	Electronic Devices	3	0	0	3
7	17154FE74B	Testing of Materials	3	0	0	3
8	17155FE74B	Waste water Treatment	3	0	0	3

CREDITS DISTRIBUTION

CGPA CREDITS

Semester	Core	Elective	Free Elective	Comprehensive Exit Course	RSD Course	Others	Total
I	28	-	-	-	-	-	28
II	28	-	-	-	-	-	28
III	23	-	-	-	-	-	23
IV	25	-	-	-	01	-	26
V	20	-	03	-	03	-	26
VI	15	06	-	-	02	-	23
VII	13	06	03	-	04	-	26
VIII	12	06	-	02	-	-	20
Over ALL Credits							200

NON CGPA CREDITS

Semester	Add on course	Total
I	01	01
II	01	01
III	-	-
IV	-	-
V	-	-
VI	-	-
VII	-	-
VIII	-	-
Co curricular Activities	In-plant Training , Industrial Visit , Seminars & Conferences	03
TOTAL NON-CGPA CREDITS		05

TOTAL CREDITS	
CGPA CREDITS	200
NON-CGPA CREDITS	05
TOTAL	205

SYLLABI

17147S11

COMMUNICATIVE ENGLISH

L	T	P	C
5	1	0	4

OBJECTIVES:

- || To develop the basic reading and writing skills of first year engineering and technology students.
- || To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- || To help learners develop their speaking skills and speak fluently in real contexts.
- || To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-** modal verbs- present/ past perfect tense - **Vocabulary development-** collocations- fixed and semi-fixed expressions

REFERENCES

- 1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
- 2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skills for Business English**. Cambridge University Press, Cambridge: Reprint 2011
- 3 Dutt P. Kiranmai and Rajeevan Geeta. **Basic Communication Skills**, Foundation Books: 2013
- 4 Means, L. Thomas and Elaine Langlois. **English & Communication For Colleges**. Cengage Learning, USA: 2007
- 5 Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005

17148S12

ENGINEERING MATHEMATICS - I

L	T	P	C
5	1	0	4

OBJECTIVES :

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS

12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS

12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS

12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS

12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

17149S14

ENGINEERING CHEMISTRY

L T P C
5 1 0 4**OBJECTIVES:**

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- || Preparation, properties and applications of engineering materials.
- || Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- || Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

17154S15**ENGINEERING GRAPHICS****LT P C
5 1 0 4****OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- | familiarize with the fundamentals and standards of Engineering graphics
- | perform freehand sketching of basic geometrical constructions and multiple views of objects.
- | project orthographic projections of lines and plane surfaces.
- | draw projections and solids and development of surfaces.
- | visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

17150S16

PROBLEM SOLVING AND PYTHON PROGRAMMING

L T P C

5 1 0 4

COURSE OBJECTIVES:

- || To know the basics of algorithmic problem solving
- || To read and write simple Python programs.
- || To develop Python programs with conditionals and loops.
- || To define Python functions and call them.
- || To use Python data structures — lists, tuples, dictionaries.
- || To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING

9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS

9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS

9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES

9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES

9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Develop algorithmic solutions to simple computational problems
- || Read, write, execute by hand simple Python programs.
- || Structure simple Python programs for solving problems.
- || Decompose a Python program into functions.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

17150L17	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	LT P C 0 0 3 2
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COURSE OBJECTIVES:

- || To write, test, and debug simple Python programs.
- || To implement Python programs with conditionals and loops.
- || Use functions for structuring Python programs.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

TOTAL :60 PERIODS

17149L18

PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

L T P C
0 0 3 2

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

OUTCOMES:

Upon completion of the course, the students will be able to

TOTAL: 30 PERIODS

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be**conducted) OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30**PERIODS TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

17147S21

TECHNICAL ENGLISH**L T P C****OBJECTIVES: The Course prepares second semester engineering and Technology students to: 0 4**

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary
Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-**Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;
Writing-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-
Vocabulary Development- verbal analogies **Language Development-** reported speech

TOTAL : 60 PERIODS**OUTCOMES: At the end of the course learners will be able to:**

1. Read technical texts and write area- specific texts effortlessly.
1. Listen and comprehend lectures and talks in their area of specialisation successfully.
1. Speak appropriately and effectively in varied formal and informal contexts.
1. Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

17148S22A

ENGINEERING MATHEMATICS – II

L	T	P	C
5	1	0	4

OBJECTIVES :

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS**12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS**12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z^2, cz^2, z^2 + c$ – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

OUTCOMES :**TOTAL: 60 PERIODS**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

17149S23B

PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
5	1	0	3

(Common to BME, ME, CC, ECE, EEE, E&I, ICE)

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO-ELECTRONIC DEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the students will able to

- gain knowledge on classical and quantum electron theories, and energy band structures,
- acquire knowledge on basics of semiconductor physics and its applications in various devices,
- get knowledge on magnetic and dielectric properties of materials,
- have the necessary understanding on the functioning of optical materials for optoelectronics,
- understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. “Physics for Computer Science Students”. Springer-Verlag, 2012.
2. Hanson, G.W. “Fundamentals of Nanoelectronics”. Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. “Nanotechnology: Understanding Small Systems”. CRC Press, 2014

17149S24A ENVIRONMENTAL SCIENCE AND ENGINEERING**L T P C
5 1 0 4****OBJECTIVES:**

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005

17153S25C**CIRCUIT THEORY**

L	T	P	C
5	1	0	4

OBJECTIVES:

- || To introduce electric circuits and its analysis
- || To impart knowledge on solving circuit equations using network theorems
- || To introduce the phenomenon of resonance in coupled circuits.
- || To educate on obtaining the transient response of circuits.
- || To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyse electrical circuits
- || Ability to apply circuit theorems
- || Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

17154S26C BASIC CIVIL AND MECHANICAL ENGINEERING L T P C
5 1 0 4

OBJECTIVES:

- || To impart basic knowledge on Civil and Mechanical Engineering.
- || To familiarize the materials and measurements used in Civil Engineering.
- || To provide the exposure on the fundamental elements of civil engineering structures.
- || To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

A – OVER VIEW

UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 10

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

**B – CIVIL
ENGINEERING**

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 10

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials:Bricks – stones – sand – cement – concrete – steel - timber - modern materials

UNIT III BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 15

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system– Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES: TOTAL: 60 PERIODS

On successful completion of this course, the student will be able to

- || appreciate the Civil and Mechanical Engineering components of Projects.
- || explain the usage of construction material and proper selection of construction materials.
- || measure distances and area by surveying
- || identify the components used in power plant cycle.
- || demonstrate working principles of petrol and diesel engine.
- || elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd. 1999.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. ShanthaKumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL &
MECHANICAL)**

I CIVIL ENGINEERING PRACTICE

13

Buildings:

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works. (d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture. (b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

18

Welding:

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays and funnels. (c) Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE**16**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

OUTCOMES:

On successful completion of this course, the student will be able to

TOTAL: 60 PERIODS

- fabricate carpentry components and pipe connections including plumbing works.
- use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

CIVIL**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- | | | |
|---|----------|-----|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. | |
| 2. Carpentry vice (fitted to work bench) | 15 Nos. | |
| 3. Standard woodworking tools | 15 Sets. | |
| 4. Models of industrial trusses, door joints, furniture joints | 5 each | |
| 5. Power Tools: (a) Rotary Hammer | 2 Nos | |
| (b) Demolition Hammer | 2 Nos | (c) |
| Circular Saw | 2 Nos | (d) |
| Planer | 2 Nos | (e) |
| Hand Drilling Machine | 2 Nos | (f) |

Jigsaw

2 Nos

MECHANICAL

- | | |
|---|-----------|
| 1. Arc welding transformer with cables and holders | 5 Nos. |
| 2. Welding booth with exhaust facility | 5 Nos. |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos. |
| 5. Centre lathe | 2 Nos. |
| 6. Hearth furnace, anvil and smithy tools | 2 Sets. |
| 7. Moulding table, foundry tools | 2 Sets. |
| 8. Power Tool: Angle Grinder | 2 Nos. |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

ELECTRICAL

- | | |
|---|---------|
| 1. Assorted electrical components for house wiring | 15 Sets |
| 2. Electrical measuring instruments | 10 Sets |
| 3. Study purpose items: Iron box, fan and regulator, emergency lamp | 1 each |
| 4. Megger (250V/500V) | 1 No. |
| 5. Power Tools: (a) Range Finder | 2 Nos |
| (b) Digital Live-wire detector | 2 Nos |

ELECTRONICS

- | | |
|---|---------|
| 1. Soldering guns | 10 Nos. |
| 2. Assorted electronic components for making circuits | 50 Nos. |
| 3. Small PCBs | 10 Nos. |

(b)

- | | |
|---|---------|
| 1. Multimeters | 10 Nos. |
| 2. Study purpose items: Telephone, FM radio, low-voltage power supply | |

17153L28C

ELECTRIC CIRCUITS LABORATORY**L T P C****0 0 3 2****OBJECTIVES:**

- || To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- || To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.

OUTCOMES:**TOTAL: 60 PERIODS**

- Understand and apply circuit theorems and concepts in engineering applications.
- Simulate electric circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
- 2 Function Generator (1 MHz) - 10 Nos.
- 3 Single Phase Energy Meter - 1 No.
- 4 Oscilloscope (20 MHz) - 10 Nos.
- 5 Digital Storage Oscilloscope (20 MHz) – 1 No.
- 6 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
- 7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
- 8 Single Phase Wattmeter – 3 Nos.
- 9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
- 10 Circuit Connection Boards - 10 Nos. Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10Watt)

17149S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

OBJECTIVES :

- || To introduce the basic concepts of PDE for solving standard partial differential equations.
- || To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- || To acquaint the student with Fourier transform techniques used in wide variety of situations.
- || To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- || Understand how to solve the given standard partial differential equations.
- || Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

17153C32

DIGITAL LOGIC CIRCUITS

L	T	P	C
3	1	0	3

OBJECTIVES:

- To study various number systems and simplify the logical expressions using Boolean functions
- To study combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLDs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6+6

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 6+6

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition tability, flow tability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6+6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

TOTAL : 60PERIODS

OUTCOMES:

- Ability to design combinational and sequential Circuits.
- Ability to simulate using software package.
- Ability to study various number systems and simplify the logical expressions using Boolean functions
- Ability to design various synchronous and asynchronous circuits.
- Ability to introduce asynchronous sequential circuits and PLDs
- Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES

1. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
3. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
4. Charles H.Roth, Jr, Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon, 'Digital circuits and Design',Pearson Education, 2016.

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2014.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010

REFERENCES

1. V.V.Sarwate, 'Electromagnetic fields and waves', First Edition, Newage Publishers, 1993.
2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), McGraw Hill, 2010.
4. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2012.
5. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Eighth Reprint : 2015

17153C34

ELECTRICAL MACHINES – I

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Magnetic-circuit analysis and introduce magnetic materials
- Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner’s test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation- commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne’s test and Hopkinson’s test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:**TOTAL : 60 PERIODS**

□ Ability to analyze the magnetic-circuits.

- || Ability to acquire the knowledge in constructional details of transformers.
- || Ability to understand the concepts of electromechanical energy conversion.
- || Ability to acquire the knowledge in working principles of DC Generator.
- || Ability to acquire the knowledge in working principles of DC Motor
- || Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., 'Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rd Edition, 2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

17153C35**ELECTRON DEVICES AND CIRCUITS****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- || Understand the structure of basic electronic devices.
- || Be exposed to active and passive circuit elements.
- || Familiarize the operation and applications of transistor like BJT and FET.
- || Explore the characteristics of amplifier gain and frequency response.
- || Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS AND THYRISTORS**9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

OUTCOMES:**TOTAL : 45 PERIODS**

Upon Completion of the course, the students will be able to:

- || Explain the structure and working operation of basic electronic devices.
- || Able to identify and differentiate both active and passive elements
- || Analyze the characteristics of different electronic devices such as diodes and transistors
- || Choose and adapt the required components to construct an amplifier circuit.
- || Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. . David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7th Ed., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002.
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.

17153C36

POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor* (BWR), *Pressurized Water Reactor* (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic* (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS

9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

OUTCOMES:**TOTAL : 45 PERIODS****Upon the completion of this course the students will be able to**

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

17153L37

ELECTRONICS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter , common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Realization of passive filters

OUTCOMES:

- Ability to understand and analyse electronic circuits.

TOTAL: 60 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, $\pm 15V$ 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

17153L38

ELECTRICAL MACHINES LABORATORY-I**L T P C****0 0 3 2****OBJECTIVES:**

- To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

OUTCOMES:**TOTAL: 60 PERIODS**

- Ability to understand and analyze DC Generator
- ! Ability to understand and analyze DC Motor
- ! Ability to understand and analyse Transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos

17149S41C

NUMERICAL METHODS

L	T	P	C
4	0	0	4

OBJECTIVES :

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

17153C42	ELECTRICAL MACHINES – II	L	T	P	C
		2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details – Types of rotors – Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL : 60 PERIODS

OUTCOMES:

- Ability to understand the construction and working principle of Synchronous Generator
- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

17153C43**TRANSMISSION AND DISTRIBUTION**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABLES 9

Underground cables - Types of cables – Construction of single core and 3 core Cables - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cables - Grading of cables - Power factor and heating of cables– DC cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law – AC and DC distributions - Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To acquire knowledge on Underground Cables
- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffe, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 2013

17153C44

MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Basic functional elements of instrumentation
- Fundamentals of electrical and electronic instruments
- Comparison between various measurement techniques
- Various storage and display devices
- Various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS 9

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL : 45 PERIODS**OUTCOMES:**

- To acquire knowledge on Basic functional elements of instrumentation
- To understand the concepts of Fundamentals of electrical and electronic instruments
- Ability to compare between various measurement techniques
- To acquire knowledge on Various storage and display devices
- To understand the concepts Various transducers and the data acquisition systems
- Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

TEXT BOOKS:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2010.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2013.
3. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, McGraw Hill Education Pvt. Ltd., 2007.

REFERENCES

1. H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, III Edition 2010.
2. D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.
3. David Bell, ' Electronic Instrumentation & Measurements', Oxford University Press,2013.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

17153C45	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following topics

- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- IC fabrication procedure.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers, summer, differentiator and integrator-V/I & I/V converters.

UNIT III APPLICATIONS OF OPAMP 9

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analog multiplier & Divider, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit,—D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNIT IV SPECIAL ICs 9

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V APPLICATION ICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd, Buchla, "Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016.
6. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

17153C46

CONTROL SYSTEMS

L T P C

3 2 0 4

COURSE OBJECTIVES

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis and design of compensators

UNIT I SYSTEMS AND REPRESENTATION**9**

Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE**9**

Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE**9**

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications

UNIT IV STABILITY AND COMPENSATOR DESIGN**9**

Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS**9**

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL (L: 45+T:30): 75 PERIODS**COURSE OUTCOMES**

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of
 - Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers, 2017.
2. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, “Modern Control Engineering”, Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on “Control Engineering “by Prof. S. D. Agashe, IIT Bombay.

17153L47

ELECTRICAL MACHINES LABORATORY - II

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

- Regulation of three phase alternator by EMF and MMF methods.
- Regulation of three phase alternator by ZPF and ASA methods.
- Regulation of three phase salient pole alternator by slip test.
- Measurements of negative sequence and zero sequence impedance of alternators.
- V and Inverted V curves of Three Phase Synchronous Motor.
- Load test on three-phase induction motor.
- No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
- Separation of No-load losses of three-phase induction motor.
- Load test on single-phase induction motor.
- No load and blocked rotor test on single-phase induction motor.
- Study of Induction motor Starters

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines
- Ability to acquire knowledge on separation of losses

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Synchronous Induction motor 3HP – 1 No.
- DC Shunt Motor Coupled With Three phase Alternator – 4 nos
- DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
- Three Phase Induction Motor with Loading Arrangement – 2 nos
- Single Phase Induction Motor with Loading Arrangement – 2 nos
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Three Phase Auto Transformer – 3 nos
- Single Phase Resistive Loading Bank – 2 nos
- Three Phase Resistive Loading Bank – 2 nos
- Capacitor Bank – 1 No.

17153C51

POWER SYSTEM ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To model the power system under steady state operating condition
- || To understand and apply iterative techniques for power flow analysis
- || To model and carry out short circuit studies on power system
- || To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off- nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to model the power system under steady state operating condition
- || Ability to understand and apply iterative techniques for power flow analysis
- || Ability to model and carry out short circuit studies on power system
- || Ability to model and analyze stability problems in power system
- | Ability to acquire knowledge on Fault analysis.
- | Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

17153C52**MICROPROCESSORS AND MICROCONTROLLERS**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Architecture of μ P8085 & μ C 8051
- || Addressing modes & instruction set of 8085 & 8051.
- || Need & use of Interrupt structure 8085 & 8051.
- || Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR**9**

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- || Ability to need & use of Interrupt structure 8085 & 8051.
- || Ability to understand the importance of Interfacing
- || Ability to explain the architecture of Microprocessor and Microcontroller.
- || Ability to write the assembly language programme.
- || Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, “Microprocessor and Microcontrollers”, PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, ‘Microprocessor Architecture Programming and Application’, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely ‘The 8051 Micro Controller and Embedded Systems’, PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM, ” Computer Fundamentals Architecture and Organization” New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051,McGraw Hill Edu,2013.
4. Ajay V.Deshmukh, ‘Microcontroller Theory & Applications’, McGraw Hill Edu,2016
5. Douglas V.Hall, ‘Microprocessor and Interfacing’, McGraw Hill Edu,2016.

17153C53	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Different types of power semiconductor devices and their switching
- || Operation, characteristics and performance parameters of controlled rectifiers
- || Operation, switching techniques and basics topologies of DC-DC switching regulators.
- Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters— performance parameters –Effect of source inductance— Firing Schemes for converter—Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy— Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters (both 120° mode and 180° mode)— Voltage & harmonic control—PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter, Applications-Induction heating, UPS.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers—Control strategy- Power Factor Control – Multistage sequence control –single phase and three phase cyclo converters – Introduction to Matrix converters, Applications –welding .

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to analyse AC-AC and DC-DC and DC-AC converters.
- || Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCES

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal, "Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

17153C55

DIGITAL SIGNAL PROCESSING

L	T	P	C
2	2	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Signals and systems & their mathematical representation.
- || Discrete time systems.
- || Transformation techniques & their computation.
- || Filters and their design for digital implementation.
- || Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION**6+6**

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS**6+6**

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION**6+6**

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS**6+6**

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS**6+6**

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.

TOTAL : 60 PERIODS**OUTCOMES:**

1. Ability to understand the importance of Fourier transform, digital filters and DS Processors.
2. Ability to acquire knowledge on Signals and systems & their mathematical representation.
3. Ability to understand and analyze the discrete time systems.
4. Ability to analyze the transformation techniques & their computation.
5. Ability to understand the types of filters and their design for digital implementation.
6. Ability to acquire knowledge on programmability digital signal processor & quantization effects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman, 'Fundamentals of Digital Signal Processing', Wiley, 2013

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1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010 3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

17153C56

OBJECT ORIENTED PROGRAMMING

L T P C

3 0 0 3

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- || To know the principles of packages, inheritance and interfaces
- || To define exceptions and use I/O streams
- || To develop a java application with threads and generics classes
- || To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS

10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES

9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O

9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING

8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- || Develop Java programs using OOP principles
- || Develop Java programs with the concepts inheritance and interfaces
- || Build Java applications using exceptions and I/O streams
- || Develop Java applications with threads and generics classes
- || Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

17153L57 CONTROL AND INSTRUMENTATION LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges
9. Dynamics of Sensors/Transducers
 - (a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f) Flow
- 10 Power and Energy Measurement
- 11 Signal Conditioning
 - (a) Instrumentation Amplifier
 - (b) Analog – Digital and Digital –Analog converters (ADC and DACs)
- 12 Process Simulation

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand control theory and apply them to electrical engineering problems.
- || Ability to analyze the various types of converters.
- || Ability to design compensators
- || Ability to understand the basic concepts of bridge networks.
- || Ability to the basics of signal conditioning circuits.
- || Ability to study the simulation packages.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID controller simulation and learner kit – 1 No.
2. Digital storage Oscilloscope for capturing transience- 1 No
 - 2 Personal Computer with control system simulation packages - 10 Nos
3. DC motor –Generator test set-up for evaluation of motor parameters
4. CRO 30MHz – 1 No.
5. 2MHz Function Generator – 1No.
6. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
7. AC Synchro transmitter& receiver – 1No.
8. Sufficient number of Digital multi meters, speed and torque sensors

INSTRUMENTATION:

9. R, L, C Bridge kit (with manual)
10. a) Electric heater – 1No.
Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.
b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump – 1 No. (with necessary connecting tubes)
c) LVDT20mm core length movability type – 1No. CRO 30MHz – 1No. d)
Optical sensor – 1 No. Light source
e) Strain Gauge Kit with Handy lever beam – 1No.

- 100gm weights – 10 nos
 f) Flow measurement Trainer kit – 1 No.
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter
 Voltmeter Rheostat Stop watch
 Connecting wires (3/20)
 12. IC Transistor kit – 1No.
 13. Instrumentation Amplifier kit-1 No
 14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

17153L58

**OBJECT ORIENTED PROGRAMMING
 LABORATORY**

**L T P C
 0 0 3 2**

COURSE OBJECTIVES

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:
 - First 100 units - Rs. 1 per unit
 - 101-200 units - Rs. 2.50 per unit
 - 201 -500 units - Rs. 4 per unit
 - > 501 units - Rs. 6 per unit
 If the type of the EB connection is commercial, calculate the amount to be paid as follows:
 - First 100 units - Rs. 2 per unit
 - 101-200 units - Rs. 4.50 per unit
 - 201 -500 units - Rs. 6 per unit
 - > 501 units - Rs. 7 per unit
2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. Write a program to perform string operations using ArrayList. Write functions for the following
 - a. Append - add at end
 - b. Insert – add at particular index c.
 - Search
 - d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations
 - b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

COURSE OUTCOMES**TOTAL : 60 PERIODS**

Upon completion of the course, the students will be able to □ Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

- Develop and implement Java programs with arraylist, exception handling and multithreading .
- Design applications using file processing, generic programming and event handling.

17153L59**PROFESSIONAL COMMUNICATION****L T P C
0 0 2 1****OBJECTIVES: The course aims to:**

- || Enhance the Employability and Career Skills of students
- || Orient the students towards grooming as a professional
- || Make them Employability Graduates
- || Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview –one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes.

TOTAL : 30 PERIODS**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. **Globearena**
2. **Win English**

REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

SOLID STATE DRIVES

L	T	P	C
3	0	0	3

17153C61

OBJECTIVES:

To impart knowledge on the following Topics

- || Steady state operation and transient dynamics of a motor load system.
- || Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- || Operation and performance of AC motor drives.
- || Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive- Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control- Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and suggest a converter for solid state drive.
- || Ability to select suitability drive for the given application.
- || Ability to study about the steady state operation and transient dynamics of a motor load system.
- || Ability to analyze the operation of the converter/chopper fed dc drive.
- || Ability to analyze the operation and performance of AC motor drives.
- || Ability to analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, “ Electric Drives Concepts and Applications ”, 2e, McGraw Hill, 2016

2. Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
4. Theodore Wildi, "Electrical Machines, Drives and power systems, 6th edition, Pearson Education, 2015
5. N.K. De., P.K. SEN "Electric drives" PHI, 2012.

17153C62	PROTECTION AND SWITCHGEAR	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- || Characteristics and functions of relays and protection schemes.
- || Apparatus protection, static and numerical relays
- || Functioning of circuit breaker

UNIT I PROTECTION SCHEMES 9

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS 9

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF₆, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Electromagnetic and Static Relays.
- || Ability to suggest suitability circuit breaker.
- || Ability to find the causes of abnormal operating conditions of the apparatus and system.

- || Ability to analyze the characteristics and functions of relays and protection schemes.
- || Ability to study about the apparatus protection, static and numerical relays.
- || Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age InternationalPvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition,Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., NewDelhi, 2009.
5. VK Metha," Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani,'Protection and Switchgear' Oxford University Press, 2011.

17153C63**EMBEDDED SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES

To impart knowledge on the following Topics

- || Building Blocks of Embedded System
- || Various Embedded Development Strategies
- || Bus Communication in processors, Input/output interfacing.
- || Various processor scheduling algorithms.
- || Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication– synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand and analyze Embedded systems.
- | Ability to suggest an embedded system for a given application.
- | Ability to operate various Embedded Development Strategies
- | Ability to study about the bus Communication in processors.
- | Ability to acquire knowledge on various processor scheduling algorithms.
- | Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010
2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013
3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

17153L66 POWER ELECTRONICS AND DRIVES LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter

- 8 IGBT based three phase PWM inverter
- 9 AC Voltage controller
- 10 Switched mode power converter.
- 11 Simulation of PE circuits (1 Φ & 3 Φ semi converters, 1 Φ & 3 Φ full converters, DC-DC converters, AC voltage controllers).
- 12 Characteristics of GTO & IGCT.
- 13 Characteristics of PMBLDC motor

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- Ability to experiment about switching characteristics various switches.
- Ability to analyze about AC to DC converter circuits.
- Ability to analyze about DC to AC circuits.
- Ability to acquire knowledge on AC to AC converters
- Ability to acquire knowledge on simulation software.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Device characteristics(for SCR, MOSFET, TRIAC,GTO,IGCT and IGBT kit with built-in / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter module/Discrete Component – 2
5. IGBT based three phase PWM inverter module/Discrete Component – 2
6. Switched mode power converter module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module – 1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer – 5
12. Single phase Auto transformer –3
13. Components (Inductance, Capacitance) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tabilitys – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

17153L67

**MICROPROCESSORS AND MICROCONTROLLERS
LABORATORY**

L T P C
0 0 3 2

OBJECTIVES:

- To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.
- To simulate various microprocessors and microcontrollers using KEIL or Equivalent simulator.

LIST OF EXPERIMENTS

- 1 Simple arithmetic operations: addition / subtraction / multiplication / division.
- 2 Programming with control instructions:
 - (i) Ascending / Descending order, Maximum / Minimum of numbers. (ii) Programs using Rotate instructions.
 - (iii) Hex / ASCII / BCD code conversions.
- 3 Interface Experiments: with 8085
 - (i) A/D Interfacing. & D/A Interfacing.
- 4 Traffic light controller.
- 5 I/O Port / Serial communication
- 6 Programming Practices with Simulators/Emulators/open source
- 7 Read a key ,interface display
- 8 Demonstration of basic instructions with 8051 Micro controller execution, including: (i) Conditional jumps & looping
(ii) Calling subroutines.
- 9 Programming I/O Port and timer of 8051 (i) study on interface with A/D & D/A
(ii) Study on interface with DC & AC motors
- 10 Application hardware development using embedded processors.

TOTAL: 60 PERIODS**OUTCOMES:**

- Ability to understand and apply computing platform and software for engineering problems.
- Ability to programming logics for code conversion.
- Ability to acquire knowledge on A/D and D/A.
- Ability to understand basics of serial communication.
- Ability to understand and impart knowledge in DC and AC motor interfacing.
- Ability to understand basics of software simulators.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power Supply	15
2.	8051 Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

17153MP68**MINI PROJECT****LT P C****0 0 2****OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

17153C71

HIGH VOLTAGE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of capability.

OUTCOMES:**TOTAL : 45 PERIODS**

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the day-to-day operation of electric power system.
- || Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- || Ability to understand the significance of power system operation and control.
- || Ability to acquire knowledge on real power-frequency interaction.
- || Ability to understand the reactive power-voltage interaction.
- || Ability to design SCADA and its application for real time operation

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

17153C73

RENEWABLE ENERGY SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Awareness about renewable Energy Sources and technologies.
- || Adequate inputs on a variety of issues in harnessing renewable Energy.
- || Recognize current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY 9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY 9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES 9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to create awareness about renewable Energy Sources and technologies.
- || Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- || Ability to recognize current and possible future role of renewable energy sources.
- || Ability to explain the various renewable energy resources and technologies and their applications.
- || Ability to understand basics about biomass energy.
- || Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis,” Engineering Applications in Sustainable Design and Development”, Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, ‘Non-conventional Energy resources’ Pearson Education ,2015.

17153L77**POWER SYSTEM SIMULATION LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- To provide better understanding of power system analysis through digital simulation.

LIST OF EXPERIMENTS

- 1 Computation of Transmission Line Parameters
- 2 Formation of Bus Admittance and Impedance Matrices and Solution of Networks
- 3 Power Flow Analysis using Gauss-Seidel Method
- 4 Power Flow Analysis using Newton Raphson Method
- 5 Symmetric and unsymmetrical fault analysis
- 6 Transient stability analysis of SMIB System
- 7 Economic Dispatch in Power Systems
- 8 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
- 9 State estimation: Weighted least square estimation
- 10 Electromagnetic Transients in Power Systems : Transmission Line Energization

OUTCOMES:**TOTAL: 60 PERIODS**

- Ability to understand power system planning and operational studies.
- Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- Ability to analyze the power flow using GS and NR method
- Ability to find Symmetric and Unsymmetrical fault
- Ability to understand the economic dispatch.
- Ability to analyze the electromagnetic transients.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Personal computers (Intel i3, 80GB, 2GBRAM) – 30 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Intel i5, 80GB, 2GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software with 5 user license
6. Compilers: C, C++, VB, VC++ - 30 users

RENEWABLE ENERGY SYSTEMS LABORATORY	L	T	P	C
	0	0	3	2

OBJECTIVES:

- To train the students in Renewable Energy Sources and technologies.
- To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- 1 Simulation study on Solar PV Energy System.
- 2 Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
- 3 Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
- 4 Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- 5 Simulation study on Wind Energy Generator.
- 6 Experiment on Performance assessment of micro Wind Energy Generator.
- 7 Simulation study on Hybrid (Solar-Wind) Power System.
- 8 Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- 9 Simulation study on Hydel Power.
- 10 Experiment on Performance Assessment of 100W Fuel Cell.
- 11 Simulation study on Intelligent Controllers for Hybrid Systems.

OUTCOMES:

- Ability to understand and analyze Renewable energy systems.

TOTAL: 60 PERIODS

- Ability to train the students in Renewable Energy Sources and technologies.
- Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- Ability to simulate the various Renewable energy sources.
- Ability to recognize current and possible future role of Renewable energy sources.
- Ability to understand basics of Intelligent Controllers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the equipments / Components	Quantity Required	Remarks
1.	Personal computers (Intel i3, 80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	PV panels - 100W, 24V	1	
5.	Battery storage system with charge and discharge control 40Ah	1	
6.	PV Emulator	1	
7.	Micro Wind Energy Generator module	1	

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

17153P83PW**PROJECT WORK****L T P C****0 0 20 10****OBJECTIVES:**

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OUTCOMES:**TOTAL: 300 PERIODS**

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

17153CEC -COMPS**0 0 2 2****Electric Circuits and Fields:**

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems:

Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines:

Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems:

Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems:

Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements:

Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics:

Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives:

Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

17153E64A**ADVANCED CONTROL SYSTEM****LT P C****2 2 0 3****OBJECTIVES**

- i. To provide knowledge on design state feedback control and state observer.
- ii. To provide knowledge in phase plane analysis.
- iii. To give basic knowledge in describing function analysis.
- iv. To study the design of optimal controller.
- v. To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE ANALYSIS**6+6**

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN**6+6**

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS**6+6**

Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS**6+6**

Introduction, common physical nonlinearities, The phase plane method: concepts, singular points, stability of non linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL**6+6**

Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

OUTCOMES:**TOTAL: 60 PERIODS**

- i. Able to design state feedback controller and state observer.
- ii. Able to understand and analyse linear and nonlinear systems using phase plane method.
- iii. Able to understand and analyse nonlinear systems using describing function method.
- iv. Able to understand and design optimal controller.
- v. Able to understand optimal estimator including Kalman Filter.
- vi. Ability to apply advanced control strategies to practical engineering problems.

TEXT BOOKS:

1. M.Gopal, "Digital Control and State Variable Methods", 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, "Modern Control Engineering", 5th Edition, Pearson, 2012.
3. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

REFERENCES:

1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Taylor and Francis Group, 2011.
3. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.

17153E64B**VISUAL LANGUAGES AND APPLICATIONS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
 - To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- To study about the integrated development programming event driven programming, variabilitys, constants, procedures and basic ActiveX controls in visual basic.
- To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I FUNDAMENTALS OF WINDOWS AND MFC**9**

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective. The benefits of C++ and MFC - MFC design philosophy – Document / View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map. Drawing the lines – Curves – Ellipse – Polygons and other shapes. GDI pens – Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II RESOURCES AND CONTROLS**9**

Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus. The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Model dialog boxes – Modeless dialog boxes.

UNIT III DOCUMENT / VIEW ARCHITECTURE**9**

The in existence function revisited – Document object – View object – Frame window object – Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document – Mid squares application – Supporting multiple document types – Alternatives to MDI. Splitter Windows: Dynamic splitter window – Static splitter windows. Creating & initializing a toolbar - Controlling the toolbar's visibility – Creating & initializing a status bar - Creating custom status bar panes – Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing – C file derivatives – Serialization basics - Writing serializability classes.

UNIT IV FUNDAMENTALS OF VISUAL BASIC**9**

Menu bar – Tool bar – Project explorer – Toolbox – Properties window – Form designer – Form layout – Intermediate window. Designing the user interface: Aligning the controls – Running the application – Visual development and event driven programming.

Variabilitys: Declaration – Types – Converting variability types – User defined data types - Lifetime of a variability. Constants - Arrays – Types of arrays. Procedures: Subroutines – Functions – Calling procedures. Text box controls – List box & Combo box controls – Scroll bar and slider controls – File controls.

UNIT V DATABASE PROGRAMMING WITH VB**9**

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Tablity def object, Query def object. Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

OUTCOMES:

- || Ability to understand and apply computing platform and software for engineering problems
- || Ability to study about the concepts of windows programming models.
- || Ability to study the concepts of Menu basics, menu magic and classic controls.
- || Ability to study the concept of Document/View Architecture with single & multiple document interface.
- || Ability to study about the integrated development programming event driven programming.
- || Ability to understand the database and the database management system.

TEXT BOOKS:

1. Jeff Prosize, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors (P) Ltd, Reprinted, 2002.
2. Evangelos Petroustos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFERENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, McGraw Hill, reprinted, 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', McGraw Hill, Reprinted, 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

17153E64C**DESIGN OF ELECTRICAL APPARATUS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Magnetic circuit parameters and thermal rating of various types of electrical machines.
- || Armature and field systems for D.C. machines.
- || Core, yoke, windings and cooling systems of transformers.
- || Design of stator and rotor of induction machines and synchronous machines.
- || The importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE**9**

Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage – Leakage in Armature. Design of lap winding and wave winding.

UNIT II DESIGN OF TRANSFORMERS**9**

Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS 9

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizing current - Short circuit current – Circle diagram - Computer program: Design of slip-ring rotor

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field MMF – Design of field winding – Design of turbo alternators -Computer program: Design of Stator main dimensions-Brushless DC Machines

OUTCOMES: TOTAL : 45 PERIODS

- || Ability to understand basics of design considerations for rotating and static electrical machines
- || Ability to design of field system for its application.
- || Ability to design single and three phase transformer.
- || Ability to design armature and field of DC machines.
- || Ability to design stator and rotor of induction motor.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, Fifth Edition, 1984.
2. M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Lt, 2011.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, Vikas Publishing House Private Limited, 1981.
3. V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications, 2008

17153E64D

POWER SYSTEM STABILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the fundamental concepts of stability of power systems and its classification.
- To expose the students to dynamic behaviour of the power system for small and large disturbances.
- To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY 9

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies(classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation of small-signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small-signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY 9

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY 9

Factors affecting voltage stability- Classification of Voltage stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY 9

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will attain knowledge about the stability of power system
- || Learners will have knowledge on small-signal stability, transient stability and voltage stability.
- || Learners will be able to understand the dynamic behaviour of synchronous generator for different disturbances.
- Learners will be able to understand the various methods to enhance the stability of a power system.

TEXT BOOKS:

1. Power system stability and control ,P. Kundur ; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.
2. R.Ramnujam,” Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009
3. T.V. Cutsem and C.Vournas, “Voltage Stability of Electric Power Systems”, Kluwer publishers, 1998.

REFERENCES

- 1 Peter W., Saucer, Pai M.A., “Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.
- 2 EW. Kimbark., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 2013.
- 3 SB. Crary., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 1955.
- 4 K.N. Shubhanga,“Power System Analysis” Pearson, 2017.
- 5 Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008
- 6 Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

17153E64E**MODERN POWER CONVERTERS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Switched mode power supplies
- Matrix Converter
- Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

OUTCOMES:

- Ability to suggest converters for AC-DC conversion and SMPS

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, New York, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

17153E64F	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL:45 PERIODS

OUTCOME:

- +□ Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

17153E65A

PRINCIPLES OF ROBOTICS**L T P C**
3 0 0 3**OBJECTIVES:**

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS

9

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS

9

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS

9

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING

9

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL

9

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIOD**OUTCOMES:**

- Ability to understand basic concept of robotics.
- To analyze Instrumentation systems and their applications to various
- To know about the differential motion and statics in robotics
- To know about the various path planning techniques.
- To know about the dynamics and control in robotics industries.

TEXT BOOKS:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2005.
2. JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. K. K.Appu Kuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, “ Embedded Systems & Robotics” – Projects using the 8051 Microcontroller”, Cengage Learning, 2009.

17153E65B**SPECIAL ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctance motors.
- Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) 9

Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- Ability to select a special Machine for a particular application.

TEXT BOOKS:

- K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984
- E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

17153E65C**POWER QUALITY**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Causes & Mitigation techniques of various PQ events.
- Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL 9

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS 9

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
- Ability to analyze the causes & Mitigation techniques of various PQ events.
- Ability to study about the various Active & Passive power filters.
- Ability to understand the concepts about Voltage and current distortions, harmonics.
- Ability to analyze and design the passive filters.
- Ability to acquire knowledge on compensation techniques.
- Ability to acquire knowledge on DVR.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagh, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality”, McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, “Power System Quality Assessment”, (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” Wiley, 2015.

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press), 2000.

17153E65D

EHVAC TRANSMISSION

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- EHVAC Transmission lines
- Electrostatic field of AC lines
- Corona in E.H.V. lines

UNIT I INTRODUCTION 9

EHVAC Transmission line trends and preliminary aspect - standard transmission voltages – Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

UNIT II ELECTROSTATIC FIELDS 9

Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

UNIT III POWER CONTROL 9

Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and overvoltage in EHV lines: No load voltage – Charging currents at power frequency- Voltage control – Shunt and Series compensation – Static VAR compensation.

UNIT IV CORONA EFFECTS AND RADIO INTERFERENCE 9

Corona in EHV lines – Corona loss formulae-Charge voltage diagram- Attenuation of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.

UNIT V STEADY STATE AND TRANSIENT LIMITS 9

Design of EHV lines based on steady state and transient limits - EHV capabilities and their characteristics-Introduction six phase transmission – UHV.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand the principles and types of EHVAC system.
- Ability to analyze the electrostatic field of AC lines
- Ability to study about the compensation.
- Ability to study about the corona in E.H.V. lines
- Ability to understand the EHV capabilities.
- Ability to analyze the steady state and transient limits.

TEXT BOOKS:

1. Rokosh Das Begamudre, "Extra High Voltage AC Transmission Engineering"– Wiley Eastern LTD., NEW DELHI 1990.
2. S. Rao, "HVAC and HVDC Transmission, Engineering and Practice" Khanna Publisher, Delhi, 1990.

REFERENCES

1. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India Private Limited, 2013.

2. RD Begamudre, "Extra High Voltage AC Transmission Engineering"– New Academic Science Ltd; 4 edition 2011.
3. Edison," EHV Transmission line"- Electric Institution, GEC, 1968.

**17153E65E COMMUNICATION ENGINEERING L T P C
3 0 0 3**

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the various analog and digital modulation techniques
- To study the principles behind information theory and coding
- To study the various digital communication techniques

UNIT I ANALOG MODULATION 9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNIT II PULSE MODULATION 9

Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL MODULATION AND TRANSMISSION 9

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING 9

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS 9

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

OUTCOMES:

At the end of the course, the student should be able to:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.
-

TEXT BOOKS:

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems” TMH 2007
2. S. Haykin “Digital Communications” John Wiley 2005

REFERENCES:

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University
2. H P Hsu, Schaum Outline Series – “Analog and Digital Communications” TMH 2006
3. B.Sklar, Digital Communications Fundamentals and Applications” 2/e Pearson Education 2007.

17153E75A

DISASTER MANAGEMENT

LT P C

3 0 3

OBJECTIVES:

- || To provide students an exposure to disasters, their significance and types.
- || To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- || To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- || To enhance awareness of institutional processes in the country and
- || To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS**9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)**9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA)
– Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA**9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS**9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS**OUTCOMES:**

The students will be able to

- || Differentiate the types of disasters, causes and their impact on environment and society
- || Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

17153E75B**HUMAN RIGHTS****L T P C
3 0 0 3****OBJECTIVES :**

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I**9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II**9**

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III**9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV**9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V**9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS**OUTCOME :**

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

17153E75C	OPERATIONS RESEARCH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS 15

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS 6

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS 6

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS 10

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variability search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of this course, the students can ability to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

1. Hillier and Libeberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.

2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

17153E75D

PROBABILITY AND STATISTICS

L	T	P	C
3	0	0	3

OBJECTIVES :

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES**12**

Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES**12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS**12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS**12**

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL**12**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students will be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
 - || Apply the concept of testing of hypothesis for small and large samples in real life problems.
 - || Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES :

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

17153E75E

FIBRE OPTICS AND LASER INSTRUMENTS

L T P C
3 0 0 3**AIM**

:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

COURSE OBJECTIVES

- || To expose the students to the basic concepts of optical fibres and their properties.
- || To provide adequate knowledge about the Industrial applications of optical fibres.
- || To expose the students to the Laser fundamentals.
- || To provide adequate knowledge about Industrial application of lasers.
- || To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES

9

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fibre: Total internal reflection, Acceptance angle (θ_a), Numerical aperture and Skew mode, –Different types of fibres and their properties: Single and multimode fibers and Step index and graded index fibers,– fibre characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses
– Dispersion – Connectors and splicers –Fibre termination – Optical sources: Light Emitting Diode (LED), – Optical detectors: PIN Diode.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES**9**

Fibre optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fibre Optic Sensor and Displacementsensor (Extrinsic Sensor) – Fibre optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS**9**

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS**9**

Laser for measurement of distance, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS**9**

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 PERIODS**COURSE OUTCOMES (COs):**

1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
3. Understand laser theory and laser generation system.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.

TEXT BOOKS:

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
3. Eric Udd, William B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists", John Wiley & Sons, 2011.

REFERENCES:

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Ready, "Industrial Applications of Lasers", Academic Press, Digitized in 2008.

4. Monte Ross, 'Laser Applications', McGraw Hill, 1968.
5. John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
6. Keiser, G., "Optical Fiber Communication", McGraw-Hill, 3rd Edition, 2000. <http://nptel.ac.in/courses/117101002/>

17153E81A	FLEXIBLE AC TRANSMISSION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The start-of-art of the power system
- || Performance of power systems with FACTS controllers.
- || FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION 9

Real and reactive power control in electrical power transmission lines–loads & system compensation–Uncompensated transmission line–shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–TCR-FC-TCR–Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability – Steady state power transfer –Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability-prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies- Dynamic voltage restorer(DVR).

UNIT V ADVANCED FACTS CONTROLLERS 9

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand, analyze and develop analytical model of FACTS controller for power system application.
- || Ability to understand the concepts about load compensation techniques.
- || Ability to acquire knowledge on facts devices.
- || Ability to understand the start-of-art of the power system
- || Ability to analyze the performance of steady state and transients of facts controllers.
- || Ability to study about advanced FACTS controllers.

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEE press andJohnWiley&Sons,Inc,2002.
2. NarainG. Hingorani, “Understanding FACTS–Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors,Delhi-110006,2011.
3. T.J.E Miller, Power Electronics in power systems, John Wiley and sons.

REFERENCES

1. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
2. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.

SOFT COMPUTING TECHNIQUES

L	T	P	C
3	0	0	3

17153E81B**OBJECTIVES:** To impart knowledge about the following topics:

- || Basics of artificial neural network.
- || Concepts of modelling and control of neural and fuzzy control schemes.
- || Features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

UNIT III FUZZY SET THEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron – GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine – Case study – Familiarization with ANFIS toolbox.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- Ability to understand the basics of artificial neural network.
- Ability to get knowledge on modelling and control of neural.

- Ability to get knowledge on modelling and control of fuzzy control schemes.
- Ability to acquire knowledge on hybrid control schemes.
- Ability to understand the concepts of Adaptive Resonance Theory

TEXT BOOKS:

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

REFERENCES

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)”, MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, “Fuzzy Modeling and Fuzzy Control Series: Control Engineering”, 2006

17153E81C**POWER SYSTEMS DYNAMICS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- 11 Basics of dynamics and stability problems
- 11 Modeling of synchronous machines
- 11 Excitation system and speed-governing controllers.
- 11 Small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- Transient stability simulation of multi machine power system.

UNIT I INTRODUCTION 9

Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING 9

Synchronous machine - flux linkage equations - Park's transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY 9

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand and analyze power system operation, stability, control and protection.
- 11 Ability to get knowledge on the basics of dynamics and stability problems
- 11 Ability to design and modelling of synchronous machines

- Ability to study about excitation system and speed-governing controllers.
- Ability to understand the concept of small signal stability of a single-machine infinite bus system with excitation system.
- Ability to analyze the transient stability simulation.

TEXT BOOKS:

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.
2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.
3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCES

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. El-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition, 2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International, 2007.

17153E81D**SMPS AND UPS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Modern power electronic converters and its applications in electric power utility.
- Resonant converters and UPS

UNIT I DC-DC CONVERTERS 9

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II SWITCHED MODE POWER CONVERTERS 9

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III RESONANT CONVERTERS 9

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V POWER CONDITIONERS, UPS & FILTERS 9

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to analyze the state space model for DC – DC converters
- Ability to acquire knowledge on switched mode power converters.
- Ability to understand the importance of Resonant Converters.
- Ability to analyze the PWM techniques for DC-AC converters
- Ability to acquire knowledge on modern power electronic converters and its applications in electric power utility.
- Ability to acquire knowledge on filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

REFERENCES

1. Philip T Krein, "Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters,

- Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
 4. Erickson, Robert W, “Fundamentals of Power Electronics”, Springer, second edition, 2010.

17153E81E	ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || To study the generation, conservation of electrical power and energy efficient equipments.
- || To understand the principle, design of illumination systems and energy efficiency lamps.
- || To study the methods of industrial heating and welding.
- || To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

17153E81F	PROFESSIONAL ETHICS IN ENGINEERING	L T P C 3 0 0 3
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OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I	HUMAN VALUES	10
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Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II	ENGINEERING ETHICS	9
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Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III	ENGINEERING AS SOCIAL EXPERIMENTATION	9
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Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV	SAFETY, RESPONSIBILITIES AND RIGHTS	9
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Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES**8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

17153E81G**PRINCIPLES OF MANAGEMENT****L T P C****3 0 0 3****OBJECTIVES:**

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company- public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING

9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING

9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING

9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING

9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

OUTCOMES:

TOTAL: 45 PERIODS

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

17153E82A	ENERGY MANAGEMENT AND AUDITING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- To impart concepts behind economic analysis and Load management.
- Energy management on various electrical equipments and metering.
- Concept of lighting systems and cogeneration.

UNIT I INTRODUCTION 9

Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targeting and reporting - Energy audit process.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION 9

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III LIGHTING SYSTEMS 9

Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS 9

Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the basics of Energy audit process.
- Ability to understand the basics of energy management by cogeneration
- Ability to acquire knowledge on Energy management in lighting systems
- Ability to impart concepts behind economic analysis and Load management.
- Ability to understand the importance of Energy management on various electrical equipment and metering.
- Ability to acquire knowledge on HVAC.

TEXT BOOKS:

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists,.Logman Scientific & Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
5. National Productivity Council Guide Books

17153E82B**DATA STRUCTURES****LT P C****3 0 0 3****OBJECTIVES:**

- || To understand the concepts of ADTs
- || To Learn linear data structures – lists, stacks, and queues
- || To understand sorting, searching and hashing algorithms
- || To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST**9**

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES**9**

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES**9**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS**9**

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES**9**

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to:

- || Implement abstract data types for linear data structures.
- || Apply the different linear and non-linear data structures to problem solutions.
- || Critically analyze the various sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008

17153E82C HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- Planning of DC power transmission and comparison with AC power transmission.
- HVDC converters.
- HVDC system control.
- Harmonics and design of filters.
- Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy– Firing angle control– Current and extinction angle control–Starting and stopping of DC link –Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis –case study

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the principles and types of HVDC system.
- Ability to analyze and understand the concepts of HVDC converters.
- Ability to acquire knowledge on DC link control.
- Ability to understand the concepts of reactive power management, harmonics and

power flow analysis.

- Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- Ability to understand the importance of power flow in HVDC system under steady state.

TEXT BOOKS:

1. Padiyar,K.R.,“HVDC power transmission system”, New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,“High Voltage Direct Current Transmission”, Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.,“ Power System Stability and Control”, McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG,“ High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Edward Wilson Kimbark,“ Direct Current Transmission”, Vol.I, Wiley inter science, New York, London, Sydney,1971.

17153E82D	MICROCONTROLLER BASED SYSTEM DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Architecture of PIC microcontroller
- Interrupts and timers
- Peripheral devices for data communication and transfer
- Functional blocks of ARM processor
- Architecture of ARM processors

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx– Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT II INTERRUPTS AND TIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variability strings.

UNIT III PERIPHERALS AND INTERFACING 9

I²C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV INTRODUCTION TO ARM PROCESSOR 9

Architecture –ARM programmer’s model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for

Operating systems.

UNIT V ARM ORGANIZATION

9

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply computing platform and software for engineering problems.
- Ability to understand the concepts of Architecture of PIC microcontroller
- Ability to acquire knowledge on Interrupts and timers.
- Ability to understand the importance of Peripheral devices for data communication.
- Ability to understand the basics of sensor interfacing
- Ability to acquire knowledge in Architecture of ARM processors

TEXT BOOKS:

1. Peatman,J.B., “Design with PIC Micro Controllers”PearsonEducation,3rdEdition, 2004.
2. Furber,S., “ARM System on Chip Architecture” Addison Wesley trade Computer Publication, 2000.

REFERENCES

1. Mazidi, M.A.,“PIC Microcontroller” Rollin Mckinlay, Danny causey ,Prentice Hall of India, 2007.

17153E82E

SMART GRID

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Smart Grid technologies, different smart meters and advanced metering infrastructure.
- The power quality management issues in Smart Grid.
- The high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID

9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES

9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering Infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broad band over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS**OUTCOMES:**

- Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- Learners will study about different Smart Grid technologies.
- Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS:

1. Stuart Borlase "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2012.

REFERENCES

- Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol.7, No.4, November 2011.
- Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids, vol.14, 2012.
- James Momohe "Smart Grid: Fundamentals of Design and Analysis", Wiley-IEEE Press, 2012.

17153E82F**BIOMEDICAL INSTRUMENTATION****L T P C****3 0 0 3****OBJECTIVES:**

- To introduce fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters

- || To understand the basic principles in imaging techniques
- || To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS

OUTCOMES: At the end of the course students will have the

- Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- || Ability to provide latest ideas on devices of non-electrical devices.
- || Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- || Ability to understand the analysis systems of various organ types.
- || Ability to bring out the important and modern methods of imaging techniques and their analysis.
- Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John

Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

17153E82G

FUNDAMENTALS OF NANOSCIENCE

L T P C

3 0 0 3

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS

7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

- |1| Will familiarize about the science of nanomaterials
- |1| Will demonstrate the preparation of nanomaterials
- |1| Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, “The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED

THANJAVUR – 613 403 - TAMIL NADU
SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING

PROGRAM HANDBOOK

B.TECH FULL TIME

[REGULATION 2019]
[for candidates admitted to B.Tech EEE program from June 2019 onwards]

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.

PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.

PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

- A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- B. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- C. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- D. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- E. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- F. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- G. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- H. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- I. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

SKILLL

[Type here]

[Type here]

- J. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- K. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- L. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH
PROGRAMME OUTCOMES**

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMM OUTCOMES												
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	3	2	3	2	1	1	2	1	1	3	1	3
2	3	3	3	3	3	1	1	1	1	1	1	2	2
3	3	3	3	3	3	2	2	3	1	2	2	2	2

1-Reasonable: 2- Significant: 3- Strong

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

COURSE STRUCTURE

B.TECH-EEE
R 2019

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER I

S.No	Course Code	Course Title	L	T	P	C
1	19147S11	Communicative English	4	0	0	4
2	19148S12	Engineering Mathematics - I	4	0	0	4
3	19149S13	Engineering Physics	3	0	0	3
4	19149S14	Engineering Chemistry	3	0	0	3
5	19154S15	Engineering Graphics	2	0	4	4
6	19150S16	Problem Solving and Python programming	3	0	0	3
PRACTICAL						
7	19150L17	Problem Solving and Python Programming Laboratory	0	0	4	2
8	19149L18	Physics and Chemistry Laboratory	0	0	4	2
9	191VEA19	Value Education				-
TOTAL CREDITS						25

SEMESTER – II

S.No	Course Code	Course Name	L	T	P	C
1	19147S21	Technical English	4	0	0	4
2	19148S22A	Engineering Mathematics - II	4	0	0	4
3	19149S23B	Physics for Electronics Engineering	3	0	0	3
4	19149S24A	Environmental Science and Engineering	3	0	0	3
5	19153S25C	Circuit Theory**	2	2	0	3
6	19154S26C	Basic Civil and Mechanical Engineering	4	0	0	2
PRACTICAL						
7	19154L27	Engineering Practices Laboratory	0	0	4	2
8	19153L28C	Electric Circuits Laboratory	0	0	4	2
9	191ICA29	Fundamentals of Indian Constitution and Economy				-
TOTAL CREDITS						25

SEMESTER III

S.No	Course Code	Course Name	L	T	P	C
1	19149S31C	Transforms and Partial Differential Equations	3	1	0	4
2	19153C32	Digital Logic Circuits	3	1	0	4
3	19153C33	Electromagnetic Theory	2	2	0	4
4	19153C34	Electrical Machines - I**	2	2	0	4
5	19153C35	Electron Devices and Circuits	3	0	0	4
6	19153C36	Power Plant Engineering	3	0	0	4
PRACTICAL						
7	19153L37	Electronics Laboratory	0	0	3	2
8	19153L38	Electrical Machines Laboratory - I##	0	0	3	2
TOTAL CREDITS						28

SEMESTER IV

S.No	Course Code	Course Name	L	T	P	C
1	19149C41C	Numerical Methods	3	1	0	4
2	19153C42	Electrical Machines - II**	2	2	0	4
3	19153C43	Transmission and Distribution	3	1	0	4
4	19153C44	Measurements and Instrumentation	3	1	0	4
5	19153C45	Linear Integrated Circuits and Applications	3	1	0	4
6	19153C46	Control Systems	2	2	0	4
PRACTICAL						
7	19153L47	Electrical Machines Laboratory - II##	0	0	4	2
8	19153L48	Linear and Digital Integrated Circuits Laboratory	0	0	4	2
9	19153L49	Technical Seminar	0	0	2	1
10	19153CRS	Research Led Seminar	1	0	0	1
TOTAL CREDITS						30

SEMESTER – V

S.No	Course Code	Course Name	L	T	P	C
1	19153C51	Power System Analysis**	3	1	0	4
2	19153C52	Microprocessors and Microcontrollers	4	0	0	4
3	19153C53	Power Electronics**	4	0	0	4
4	19153FE54_	Free Elective - I*	3	0	0	3
5	19153C55	Digital Signal Processing	2	2	0	4
6	19153C56	Object Oriented Programming	3	1	0	4
PRACTICAL						
7	19153L57	Control and Instrumentation Laboratory###	0	0	3	2
8	19153L58	Object Oriented Programming Laboratory	0	0	3	2
9	19153L59	Professional Communication	0	0	2	1
RESEARCH SKILL DEVELOPMENT (RSD) COURSE						
10	19153CRM	Research Methodology	3	0	0	3
TOTAL CREDITS						31

SEMESTER – VI

S.No	Course Code	Course Name	L	T	P	C
1	19153C61	Solid State Drives**	4	0	0	4
2	19153C62	Protection and Switchgear	4	0	0	4
3	19153C63	Embedded Systems	4	0	0	4
4	19153E64_	Elective - I	3	0	0	3
5	19153E65__	Elective - II	3	0	0	3
PRACTICAL						
6	19153L66	Power Electronics and Drives Laboratory###	0	0	3	2
7	19153L67	Microprocessors and Microcontrollers Laboratory	0	0	3	2
8	19153MP68	Mini Project	0	0	4	2
RESEARCH SKILL DEVELOPMENT (RSD) COURSE						
9	19153CBR	Participation in Bounded Research	0	0	3	2
TOTAL CREDITS						26

SEMESTER – VII

S.No	Course Code	Course Name	L	T	P	C
1	19153C71	High Voltage Engineering	4	0	0	4
2	19153C72	Power System Operation and Control	4	0	0	4
3	19153C73	Renewable Energy Systems**	4	0	0	4
4	19153FE74_	Free Elective -II	3	0	0	3
5	19153E75_	Elective - III	3	0	0	3
6	19153E76_	Elective - IV	3	0	0	3
PRACTICAL						
7	19153L77	Power System Simulation Laboratory###	0	0	3	2
8	19153L78	Renewable Energy Systems Laboratory	0	0	3	2
RESEARCH SKILL DEVELOPMENT (RSD) COURSE						
9	19153CSR	Participation in Scaffolded Research (Design / Socio Technical Project)	0	0	5	5
TOTAL CREDITS						30

SEMESTER – VIII

S.No	Course Code	Course Name	L	T	P	C
1.	19153E81_	Elective - V	3	0	0	3
2.	19153E82_	Elective - VI	3	0	0	3
PRACTICAL						
3.	19153P81	Project Work	!	!	!	15
4.	19153PEE	Programme Exit Examination				2
TOTAL CREDITS						23
TOTAL NO.OF CREDITS =226						

** Experiential based learning courses (Theory)

- Highly Significant Laboratory Courses (Practical)

LIST OF ELECTIVES

ELECTIVE – I (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	19153E64A	Design of Electrical Apparatus	3	0	0	3
2.	19153E64B	Power Systems Stability	3	0	0	3
3.	19153E64C	Modern Power Converters	3	0	0	3
4.	19153E64D	Intellectual Property Rights	3	0	0	3

ELECTIVE – II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	19153E65A	Principles of Robotics	3	0	0	3
2.	19153E65B	Special Electrical Machines	3	0	0	3
3.	19153E65C	Power Quality	3	0	0	3
4.	19153E65D	EHVAC Transmission	3	0	0	3

ELECTIVE – III (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	19153E75A	Disaster Management	3	0	0	3
2	19153E75B	Human Rights	3	0	0	3
3	19153E75C	Operations Research	3	0	0	3
4	19153E75D	Probability and Statistics	3	0	0	3

ELECTIVE – IV (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	19153E76A	System Identification and Adaptive Control	3	0	0	3
2.	19153E76B	Control of Electrical Drives	3	0	0	3
3.	19153E76C	Power Systems Transients	3	0	0	3
4.	19153E76D	Total Quality Management	3	0	0	3

ELECTIVE – V (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	19153E81A	Flexible AC Transmission Systems	3	0	0	3
2.	19153E81B	Soft Computing Techniques	3	0	0	3
3.	19153E81C	SMPS and UPS	3	0	0	3
4.	19153E81D	Electric Energy Generation, Utilization and Conservation	3	0	0	3

ELECTIVE – VI (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	19153E82A	Energy Management and Auditing	3	0	0	3
2.	19153E82B	High Voltage Direct Current Transmission	3	0	0	3
3.	19153E82C	Smart Grid	3	0	0	3
4.	19153E82D	Biomedical Instrumentation	3	0	0	3

FREE ELECTIVE (V SEM)

S.No	Course Code	Course Name	L	T	P	C
1	19150FE54A	Database Management System	3	0	0	3
2	19152FE54A	Basics of Biomedical Instrumentation	3	0	0	3
3	19154FE54A	Renewable Energy Sources	3	0	0	3
4	19155FE54A	Air Pollution and Control Engineering	3	0	0	3
5	19150FE54B	Cloud computing	3	0	0	3
6	19152FE54B	Sensors and Transducers	3	0	0	3
7	19154FE54B	Automatic System	3	0	0	3
8	19155FE54B	Geographic Information System	3	0	0	3

FREE ELECTIVE (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	19150FE74A	Introduction to C Programming	3	0	0	3
2	19152FE74A	Robotics	3	0	0	3
3	19154FE74A	Industrial safety	3	0	0	3
4	19155FE74A	Green Building Design	3	0	0	3
5	19150FE74B	Datastructures and Algorithms	3	0	0	3
6	19152FE74B	Electronic Devices	3	0	0	3
7	19154FE74B	Testing of Materials	3	0	0	3
8	19155FE74B	Waste water Treatment	3	0	0	3

CREDITS DISTRIBUTION

CGPA CREDITS

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Sem.	Core Courses						Elective Courses				Foundation Courses		CGPA Credits	Non- CGPA Credits		Total Credits
	Theory Courses		Practical Courses		Courses on *RSD		Dept. Elective		Free Elective					Nos.	Credits	
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits				
I	02	08	02	04	-	-	-	-	-	-	04	16	28	01	01	29
II	03	12	02	04	-	-	-	-	-	-	03	12	28	01	01	29
III	05	20	02	04	-	-	-	-	-	-	01	04	28	-	-	28
IV	05	20	02	04	01	01	-	-	-	-	01	04	30	01	01	30
V	05	20	02	04	01	03	-	-	01	03	-	-	31	01	01	31
VI	03	12	03	06	01	02	02	06	-	-	-	-	26	-	-	26
VII	03	12	02	04	01	05	02	06	01	03	-	-	30	-	-	30
VIII	-	-	01	15	-	-	02	06	-	-	-	-	21	01	02	23
TOTAL CREDITS													222		04	226

*RSD-Research Skill Development

SYLLABI

19147S11

COMMUNICATIVE ENGLISH

L	T	P	C
4	1	0	4

OBJECTIVES:

- | To develop the basic reading and writing skills of first year engineering and technology students.
- | To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- | To help learners develop their speaking skills and speak fluently in real contexts.
- | To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences-- developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-**introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations- fixed and semi-fixed expressions

REFERENCES

- 1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
- 2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor BusinessEnglish**. Cambridge University Press, Cambridge: Reprint 2011
- 3 Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills**, Foundation Books: 2013
- 4 Means,L. Thomas and Elaine Langlois. **English & Communication For Colleges**. CengageLearning ,USA: 2007
- 5 Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005

19148S12

ENGINEERING MATHEMATICS - I

L	T	P	C
4	1	0	4

OBJECTIVES :

- || The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS

12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS

12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS

12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS

12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- || Use both the limit definition and rules of differentiation to differentiate functions.
- || Apply differentiation to solve maxima and minima problems.
- || Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- || Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- || Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- || Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- || Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

19149S14

ENGINEERING CHEMISTRY**L T P C**
4 1 0 4**OBJECTIVES:**

- || To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- || To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- || Preparation, properties and applications of engineering materials.
- || Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- || Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- || The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

19154S15**ENGINEERING GRAPHICS****LT P C
4 1 0 4****OBJECTIVES:**

- || To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- || To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- | familiarize with the fundamentals and standards of Engineering graphics
- | perform freehand sketching of basic geometrical constructions and multiple views of objects.
- | project orthographic projections of lines and plane surfaces.
- | draw projections and solids and development of surfaces.
- | visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. S. I.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

19150S16 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
4 1 0 4

COURSE OBJECTIVES:

- | To know the basics of algorithmic problem solving
- | To read and write simple Python programs.
- | To develop Python programs with conditionals and loops.
- | To define Python functions and call them.
- | To use Python data structures -- lists, tuples, dictionaries.
- | To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Develop algorithmic solutions to simple computational problems
- || Read, write, execute by hand simple Python programs.
- || Structure simple Python programs for solving problems.
- || Decompose a Python program into functions.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

19150L17	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	LT P C 0 0 3 2
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COURSE OBJECTIVES:

- | To write, test, and debug simple Python programs.
- | To implement Python programs with conditionals and loops.
- | Use functions for structuring Python programs.
- | Represent compound data using Python lists, tuples, dictionaries.
- | Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:**Upon completion of the course, students will be able to**

- | Write, test, and debug simple Python programs.
- | Implement Python programs with conditionals and loops.
- | Develop Python programs step-wise by defining functions and calling them.
- | Use Python lists, tuples, dictionaries for representing compound data.
- | Read and write data from/to files in Python.

TOTAL :60 PERIODS

19149L18

PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

OUTCOMES:

Upon completion of the course, the students will be able to

TOTAL: 30 PERIODS

- || apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be**conducted) OBJECTIVES:**

- || To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- || To acquaint the students with the determination of molecular weight of a polymer by viscometry.

pol

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

- || The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30**PERIODS TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

19147S21

TECHNICAL ENGLISH

L	T	P	C
4	1	0	4

OBJECTIVES: The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary
Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-**Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;
Writing-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-
Vocabulary Development- verbal analogies **Language Development-** reported speech

TOTAL : 60 PERIODS**OUTCOMES: At the end of the course learners will be able to:**

1. Read technical texts and write area- specific texts effortlessly.
1. Listen and comprehend lectures and talks in their area of specialisation successfully.
1. Speak appropriately and effectively in varied formal and informal contexts.
1. Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

19148S22A

ENGINEERING MATHEMATICS – II

L	T	P	C
4	1	0	4

OBJECTIVES :

- || This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS**12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS**12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = cz + \frac{1}{z}$ – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series
 – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals
 – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

OUTCOMES :**TOTAL: 60 PERIODS**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- | Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- | Gradient, divergence and curl of a vector point function and related identities.
- | Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- | Analytic functions, conformal mapping and complex integration.
- | Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

19149S23B

PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
4	1	0	3

(Common to BME, ME, CC, ECE, EEE, E&I, ICE)

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS

9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS

9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS

9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS

9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO-ELECTRONIC DEVICES

9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the students will able to

- gain knowledge on classical and quantum electron theories, and energy band structures,
- acquire knowledge on basics of semiconductor physics and its applications in various devices,
- get knowledge on magnetic and dielectric properties of materials,
- have the necessary understanding on the functioning of optical materials for optoelectronics,
- understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding Small Systems". CRC Press, 2014

19149S24A**ENVIRONMENTAL SCIENCE AND ENGINEERING****L T P C****4 1 0 4****OBJECTIVES:**

- | To study the nature and facts about environment.
- | To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- | To study the interrelationship between living organism and environment.
- | To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- | To study the dynamic processes and understand the features of the earth's interior and surface.
- | To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- || Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- || Public awareness of environmental is at infant stage.
- || Ignorance and incomplete knowledge has lead to misconceptions
- || Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

19153S25C

CIRCUIT THEORY

L	T	P	C
4	1	0	4

OBJECTIVES:

- | To introduce electric circuits and its analysis
- | To impart knowledge on solving circuit equations using network theorems
- | To introduce the phenomenon of resonance in coupled circuits.
- | To educate on obtaining the transient response of circuits.
- | To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyse electrical circuits
- || Ability to apply circuit theorems
- || Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M.E Van Valkenburg. "Network Analysis" Prentice-Hall of India Pvt Ltd. New Delhi

- 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
 6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
 7. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

19154S26C**BASIC CIVIL AND MECHANICAL ENGINEERING****L T P C
4 1 0 4****OBJECTIVES:**

- | To impart basic knowledge on Civil and Mechanical Engineering.
- | To familiarize the materials and measurements used in Civil Engineering.
- | To provide the exposure on the fundamental elements of civil engineering structures.
- | To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

A – OVER VIEW**UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 10**

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society – Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

**B – CIVIL
ENGINEERING****UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 10**

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber - modern materials

UNIT III BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING**UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 15**

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system– Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES:**TOTAL: 60 PERIODS**

On successful completion of this course, the student will be able to

- | appreciate the Civil and Mechanical Engineering components of Projects.
- | explain the usage of construction material and proper selection of construction materials.
- | measure distances and area by surveying
- | identify the components used in power plant cycle.
- | demonstrate working principles of petrol and diesel engine.
- | elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS,“Basic Civil and Mechanical Engineering”,Tata McGraw Hill PublishingCo.,NewDelhi,1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S.,“Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Seetharaman S.,“BasicCivil Engineering”,AnuradhaAgencies,2005.
4. ShanthaKumar SRJ.,“Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam,2000.

19154L27 ENGINEERING PRACTICES LABORATORY **L T P C**
0 0 3 2

OBJECTIVES:

- | To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE 13****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
 - (b) Study of pipe connections requirements for pumps and turbines.
 - (c) Preparation of plumbing line sketches for water supply and sewage works. (d)
- Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture. (b)
- Hands-on-exercise:
- Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE**18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. (b)
- Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
 - (b) Model making – Trays and funnels. (c)
- Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

OUTCOMES:

On successful completion of this course, the student will be able to

TOTAL: 60 PERIODS

- | fabricate carpentry components and pipe connections including plumbing works.
- | use welding equipments to join the structures.
- | Carry out the basic machining operations
- | Make the models using sheet metal works
- | Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- | Carry out basic home electrical works and appliances
- | Measure the electrical quantities
- | Elaborate on the components, gates, soldering practices.

CIVIL**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- | | | |
|---|----------|-----|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. | |
| 2. Carpentry vice (fitted to work bench) | 15 Nos. | |
| 3. Standard woodworking tools | 15 Sets. | |
| 4. Models of industrial trusses, door joints, furniture joints | 5 each | |
| 5. Power Tools: (a) Rotary Hammer | 2 Nos | |
| (b) Demolition Hammer | 2 Nos | (c) |
| Circular Saw | 2 Nos | (d) |
| Planer | 2 Nos | (e) |
| Hand Drilling Machine | 2 Nos | (f) |
| Jigsaw | 2 Nos | |

MECHANICAL

- | | |
|---|-----------|
| 1. Arc welding transformer with cables and holders | 5 Nos. |
| 2. Welding booth with exhaust facility | 5 Nos. |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos. |
| 5. Centre lathe | 2 Nos. |
| 6. Hearth furnace, anvil and smithy tools | 2 Sets. |
| 7. Moulding table, foundry tools | 2 Sets. |
| 8. Power Tool: Angle Grinder | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

19153L28C	ELECTRIC CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

- | To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- | To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.

OUTCOMES:

TOTAL: 60 PERIODS

- 1 Understand and apply circuit theorems and concepts in engineering applications.
- 2 Simulate electric circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
- 2 Function Generator (1 MHz) - 10 Nos.
- 3 Single Phase Energy Meter - 1 No.
- 4 Oscilloscope (20 MHz) - 10 Nos.
- 5 Digital Storage Oscilloscope (20 MHz) – 1 No.
- 6 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
- 7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
- 8 Single Phase Wattmeter – 3 Nos.
- 9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
- 10 Circuit Connection Boards - 10 Nos.Necessary Quantities of Resistors,Inductors, Capacitors of various capacities (Quarter Watt to 10Watt

19149S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

OBJECTIVES :

- || To introduce the basic concepts of PDE for solving standard partial differential equations.
- || To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- || To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- || To acquaint the student with Fourier transform techniques used in wide variety of situations.
- || To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS**12**

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES**12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**12**

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS**12**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS**12**

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- || Understand how to solve the given standard partial differential equations.
- || Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- || Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- || Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- || Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

19153C32**DIGITAL LOGIC CIRCUITS**

L	T	P	C
3	1	0	4

OBJECTIVES:

- | To study various number systems and simplify the logical expressions using Boolean functions
- | To study combinational circuits
- | To design various synchronous and asynchronous circuits.
- | To introduce asynchronous sequential circuits and PLDs
- | To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6+6

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 6+6

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6+6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

OUTCOMES:

TOTAL : 60PERIODS

- | Ability to design combinational and sequential Circuits.
- | Ability to simulate using software package.
- | Ability to study various number systems and simplify the logical expressions using Boolean functions
- | Ability to design various synchronous and asynchronous circuits.
- | Ability to introduce asynchronous sequential circuits and PLDs
- | Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES

1. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
3. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
4. Charles H.Roth, Jr, Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon, 'Digital circuits and Design',Pearson Education, 2016.

19153C33

ELECTROMAGNETIC THEORY

L	T	P	C
2	2	0	4

OBJECTIVES:

- | To introduce the basic mathematical concepts related to electromagnetic vector fields
- | To impart knowledge on the concepts of
 - | Electrostatic fields, electrical potential, energy density and their applications.
 - | Magneto static fields, magnetic flux density, vector potential and its applications. □ Different methods of emf generation and Maxwell's equations
 - | Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I 6+6

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II ELECTROSTATICS – II**6+6**

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS**6+6**

Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS**6+6**

Magnetic Circuits - Faraday’s law – Transformer and motional EMF – Displacement current - Maxwell’s equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES**6+6**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

TOTAL : 60 PERIODS**OUTCOMES:**

- || Ability to understand the basic mathematical concepts related to electromagnetic vector fields.
- || Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
- || Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
- || Ability to understand the different methods of emf generation and Maxwell’s equations
- || Ability to understand the basic concepts electromagnetic waves and characterizing parameters
- || Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, ‘Engineering Electromagnetics’, McGraw Hill Special Indian edition, 2014.
3. Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 2010

REFERENCES

1. V.V.Sarwate, ‘Electromagnetic fields and waves’, First Edition, Newage Publishers, 1993.
2. J.P.Tewari, ‘Engineering Electromagnetics - Theory, Problems and Applications’, Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, ‘Schaum’s Outline of Electromagnetics, Third Edition (Schaum’s Outline Series), McGraw Hill, 2010.
4. S.P.Ghosh, Lipika Datta, ‘Electromagnetic Field Theory’, First Edition, McGraw Hill Education(India) Private Limited, 2012.
5. K A Gangadhar, ‘Electromagnetic Field Theory’, Khanna Publishers; Eighth Reprint : 2015

19153C34

ELECTRICAL MACHINES – I

L	T	P	C
2	2	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- || Magnetic-circuit analysis and introduce magnetic materials
- || Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- || Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- || Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- || Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner’s test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation-commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne’s test and Hopkinson’s test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyze the magnetic-circuits.
- || Ability to acquire the knowledge in constructional details of transformers.
- || Ability to understand the concepts of electromechanical energy conversion.
- || Ability to acquire the knowledge in working principles of DC Generator.
- || Ability to acquire the knowledge in working principles of DC Motor
- || Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., 'Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rd Edition, 2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

19153C35

ELECTRON DEVICES AND CIRCUITS**L T P C
3 0 0 4****OBJECTIVES:****The student should be made to:**

- || Understand the structure of basic electronic devices.
- || Be exposed to active and passive circuit elements.
- || Familiarize the operation and applications of transistor like BJT and FET.
- || Explore the characteristics of amplifier gain and frequency response.
- || Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS AND THYRISTORS**9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers – Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

OUTCOMES:**TOTAL : 45 PERIODS**

Upon Completion of the course, the students will be able to:

- || Explain the structure and working operation of basic electronic devices.
- || Able to identify and differentiate both active and passive elements
- || Analyze the characteristics of different electronic devices such as diodes and transistors
- || Choose and adapt the required components to construct an amplifier circuit.
- || Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. . David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7th Ed., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002.
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.

19153C36

POWER PLANT ENGINEERING

L	T	P	C
3	0	0	4

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor (BWR)*, *Pressurized Water Reactor (PWR)*, *CANada Deuterium-Uranium reactor (CANDU)*, Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic (SPV)*, Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

OUTCOMES:**TOTAL : 45 PERIODS****Upon the completion of this course the students will be able to**

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

- Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

- El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
- Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
- Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition Standard Handbook of McGraw – Hill 1998

19153L37

ELECTRONICS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS

- Characteristics of Semiconductor diode and Zener diode
- Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
- Characteristics of JFET and draw the equivalent circuit
- Characteristics of UJT and generation of saw tooth waveforms
- Design and Frequency response characteristics of a Common Emitter amplifier
- Characteristics of photo diode & photo transistor, Study of light activated relay circuit
- Design and testing of RC phase shift and LC oscillators
- Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
- Differential amplifiers using FET
- Study of CRO for frequency and phase measurements
- Realization of passive filters

OUTCOMES:

- Ability to understand and analyse electronic circuits.

TOTAL: 60 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
- Resistors, Capacitors and inductors
- Necessary digital IC 8
- Function Generators 10
- Regulated 3 output Power Supply 5, $\pm 15V$ 10
- CRO 10
- Storage Oscilloscope 1
- Bread boards
- Atleast one demo module each for the listed equipments.
- Component data sheets to be provided

19153L38

ELECTRICAL MACHINES LABORATORY-I**L T P C****0 0 3 2****OBJECTIVES:**

- || To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

OUTCOMES:**TOTAL: 60 PERIODS**

- | Ability to understand and analyze DC Generator
- | Ability to understand and analyze DC Motor
- | Ability to understand and analyse Transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos

19149S41C

NUMERICAL METHODS

L	T	P	C
3	1	0	4

OBJECTIVES :

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

19153C42	ELECTRICAL MACHINES – II	L	T	P	C
		2	2	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details – Types of rotors -- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL : 60 PERIODS

OUTCOMES:

- Ability to understand the construction and working principle of Synchronous Generator
- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

19153C43

TRANSMISSION AND DISTRIBUTION

L	T	P	C
3	1	0	4

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS**9**

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABILITIES 9

Underground cabilitys - Types of cabilitys – Construction of single core and 3 core Cabilitys - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cabilitys - Grading of cabilitys - Power factor and heating of cabilitys– DC cabilitys.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin’s Law – AC and DC distributions - Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To acquire knowledge on Underground Cabilitys
- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, ‘Power System Engineering’, Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.
3. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, ‘Power System Analysis and Design’ S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffer, ‘Electrical Power Distribution and Transmission’, Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss ‘Transmission and Distribution in Electrical Engineering’, Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, “Handbook of Electrical power Distribution,” Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, ‘Principles of power system’, S. Chand & Company Ltd, New Delhi, 2013

19153C44

MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	1	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- Basic functional elements of instrumentation
- Fundamentals of electrical and electronic instruments
- Comparison between various measurement techniques
- Various storage and display devices
- Various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS 9

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL : 45 PERIODS**OUTCOMES:**

- To acquire knowledge on Basic functional elements of instrumentation
- To understand the concepts of Fundamentals of electrical and electronic instruments
- Ability to compare between various measurement techniques
- To acquire knowledge on Various storage and display devices
- To understand the concepts Various transducers and the data acquisition systems
- Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

UNIT V APPLICATION ICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd, Buchla, "Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016.
6. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

19153C46	CONTROL SYSTEMS	L T P C
		2 2 0 4

COURSE OBJECTIVES

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis and design of compensators

UNIT I SYSTEMS AND REPRESENTATION 9
 Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9
 Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE 9
 Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications

UNIT IV STABILITY AND COMPENSATOR DESIGN 9
 Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS 9
 Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL (L: 45+T:30): 75 PERIODS

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of
 - Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers, 2017.
2. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, “Modern Control Engineering”, Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and Houpis Stuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on “Control Engineering “by Prof. S. D. Agashe, IIT Bombay.

19153L47

ELECTRICAL MACHINES LABORATORY - II

L	T	P	C
0	0	4	2

OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor.
10. No load and blocked rotor test on single-phase induction motor.
11. Study of Induction motor Starters

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines
- Ability to acquire knowledge on separation of losses

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Synchronous Induction motor 3HP – 1 No.
2. DC Shunt Motor Coupled With Three phase Alternator – 4 nos
3. DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
4. Three Phase Induction Motor with Loading Arrangement – 2 nos
5. Single Phase Induction Motor with Loading Arrangement – 2 nos
6. Tachometer -Digital/Analog – 8 nos
7. Single Phase Auto Transformer – 2 nos
8. Three Phase Auto Transformer – 3 nos
9. Single Phase Resistive Loading Bank – 2 nos
10. Three Phase Resistive Loading Bank – 2 nos
11. Capacitor Bank – 1 No.

19153L48

**LINEAR AND DIGITAL INTEGRATED
CIRCUITS LABORATORY**

L T P C
0 0 4 2

OBJECTIVES:

- To learn design, testing and characterizing of circuit behavior with digital and analog ICs.

LIST OF EXPERIMENTS

- Implementation of Boolean Functions, Adder and Subtractor circuits.
- Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
- Parity generator and parity checking
- Encoders and Decoders
- Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
- Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
- Study of multiplexer and de multiplexer
- Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
- Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
- Voltage to frequency characteristics of NE/ SE 566 IC.
- Variability Voltage Regulator using IC LM317.

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and implement Boolean Functions.
- Ability to understand the importance of code conversion
- Ability to Design and implement 4-bit shift registers
- Ability to acquire knowledge on Application of Op-Amp
- Ability to Design and implement counters using specific counter IC.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual ,(0-30V) variability Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	
6	Bread board	10	

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficient quantity)			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

19153C51

POWER SYSTEM ANALYSIS

L	T	P	C
3	1	0	4

OBJECTIVES:

- | To model the power system under steady state operating condition
- | To understand and apply iterative techniques for power flow analysis
- | To model and carry out short circuit studies on power system
- | To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off-nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to model the power system under steady state operating condition
- | Ability to understand and apply iterative techniques for power flow analysis
- | Ability to model and carry out short circuit studies on power system
- | Ability to model and analyze stability problems in power system
- | Ability to acquire knowledge on Fault analysis.
- | Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

19153C52**MICROPROCESSORS AND MICROCONTROLLERS**

L	T	P	C
4	0	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- | Architecture of μ P8085 & μ C 8051
- | Addressing modes & instruction set of 8085 & 8051.
- | Need & use of Interrupt structure 8085 & 8051.
- | Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up tability - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- | Ability to need & use of Interrupt structure 8085 & 8051.
- | Ability to understand the importance of Interfacing
- | Ability to explain the architecture of Microprocessor and Microcontroller.
- | Ability to write the assembly language programme.
- | Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, “Microprocessor and Microcontrollers”, PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, ‘Microprocessor Architecture Programming and Application’, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely ‘The 8051 Micro Controller and Embedded Systems’, PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM, ” Computer Fundamentals Architecture and Organization” New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Edu, 2013.
4. Ajay V. Deshmukh, ‘Microcontroller Theory & Applications’, McGraw Hill Edu, 2016
5. Douglas V. Hall, ‘Microprocessor and Interfacing’, McGraw Hill Edu, 2016.

19153C53	POWER ELECTRONICS	L	T	P	C
		4	0	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- | Different types of power semiconductor devices and their switching
- | Operation, characteristics and performance parameters of controlled rectifiers
- | Operation, switching techniques and basics topologies of DC-DC switching regulators.
- | Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- | Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters— performance parameters –Effect of source inductance— Firing Schemes for converter—Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy– Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters (both 120° mode and 180° mode)— Voltage & harmonic control—PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter, Applications-Induction heating, UPS.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers—Control strategy- Power Factor Control – Multistage sequence control –single phase and three phase cyclo converters – Introduction to Matrix converters, Applications –welding .

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to analyse AC-AC and DC-DC and DC-AC converters.
- || Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCES

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal, "Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

19153C55**DIGITAL SIGNAL PROCESSING**

L	T	P	C
2	2	0	4

OBJECTIVES: To impart knowledge about the following topics:

- | Signals and systems & their mathematical representation.
- | Discrete time systems.
- | Transformation techniques & their computation. Filters and their design for digital implementation. Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION 6+6

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 6+6

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 6+6

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.

TOTAL : 60 PERIODS**OUTCOMES:**

1. Ability to understand the importance of Fourier transform, digital filters and DS Processors.
2. Ability to acquire knowledge on Signals and systems & their mathematical representation.
3. Ability to understand and analyze the discrete time systems.
4. Ability to analyze the transformation techniques & their computation.
5. Ability to understand the types of filters and their design for digital implementation.
6. Ability to acquire knowledge on programmability digital signal processor & quantization effects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman, 'Fundamentals of Digital Signal Processing', Wiley, 2013

REFERENCES

1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

19153C56

OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	1	0	4

OBJECTIVES:

- | To understand Object Oriented Programming concepts and basic characteristics of Java
- | To know the principles of packages, inheritance and interfaces
- | To define exceptions and use I/O streams
- | To develop a java application with threads and generics classes
- | To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- || Develop Java programs using OOP principles
- || Develop Java programs with the concepts inheritance and interfaces
- || Build Java applications using exceptions and I/O streams
- || Develop Java applications with threads and generics classes
- || Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

19153L57	CONTROL AND INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

- || To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges
9. Dynamics of Sensors/Transducers
 - (a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f) Flow
- 10 Power and Energy Measurement
- 11 Signal Conditioning
 - (a) Instrumentation Amplifier
 - (b) Analog – Digital and Digital –Analog converters (ADC and DACs)
- 12 Process Simulation

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand control theory and apply them to electrical engineering problems.
- || Ability to analyze the various types of converters.
- || Ability to design compensators
- || Ability to understand the basic concepts of bridge networks.
- || Ability to the basics of signal conditioning circuits.
- || Ability to study the simulation packages.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID controller simulation and learner kit – 1 No.
2. Digital storage Oscilloscope for capturing transience- 1 No
 - 2 Personal Computer with control system simulation packages - 10 Nos
3. DC motor –Generator test set-up for evaluation of motor parameters
4. CRO 30MHz – 1 No.
5. 2MHz Function Generator – 1No.
6. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
7. AC Synchro transmitter& receiver – 1No.
8. Sufficient number of Digital multi meters, speed and torque sensors

INSTRUMENTATION:

9. R, L, C Bridge kit (with manual)
10. a) Electric heater – 1No.
Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.
 - b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump – 1 No. (with necessary connecting tubes)
 - c) LVDT20mm core length movability type – 1No. CRO 30MHz – 1No. d)
Optical sensor – 1 No. Light source
 - e) Strain Gauge Kit with Handy lever beam – 1No.

- 100gm weights – 10 nos
 f) Flow measurement Trainer kit – 1 No.
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter
 Voltmeter Rheostat Stop watch
 Connecting wires (3/20)
 12. IC Transistor kit – 1No.
 13. Instrumentation Amplifier kit-1 No
 14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

19153L58	OBJECT ORIENTED PROGRAMMING LABORATORY	L T P C 0 0 3 2
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COURSE OBJECTIVES

- | To build software development skills using java programming for real-world applications.
- | To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- | To develop applications using generic programming and event handling.

List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

- If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. Write a program to perform string operations using ArrayList. Write functions for the following
 - a. Append - add at end
 - b. Insert – add at particular index c.
 - Search
 - d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations
 - b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

COURSE OUTCOMES**TOTAL : 60 PERIODS**

- Upon completion of the course, the students will be able to
- || Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
 - || Develop and implement Java programs with arraylist, exception handling and multithreading .
 - || Design applications using file processing, generic programming and event handling.

19153L59

PROFESSIONAL COMMUNICATION**L T P C**
0 0 2 1**OBJECTIVES: The course aims to:**

- | Enhance the Employability and Career Skills of students
- | Orient the students towards grooming as a professional
- | Make them Employability Graduates
- | Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview –one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes.

TOTAL : 30 PERIODS**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. Globearena
2. Win English

REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone.** Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBlackSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success.** Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication.** Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills.** MJP Publishers: Chennai, 2010.

SOLID STATE DRIVES

L	T	P	C
4	0	0	4

19153C61**OBJECTIVES:**

To impart knowledge on the following Topics

- | Steady state operation and transient dynamics of a motor load system.
- | Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- | Operation and performance of AC motor drives.
- | Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive- Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control- Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand and suggest a converter for solid state drive.
- | Ability to select suitability drive for the given application.
- | Ability to study about the steady state operation and transient dynamics of a motor load system.
- | Ability to analyze the operation of the converter/chopper fed dc drive.
- | Ability to analyze the operation and performance of AC motor drives.
- | Ability to analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, “ Electric Drives Concepts and Applications ”, 2e, McGraw Hill, 2016

2. Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
4. Theodore Wildi, "Electrical Machines, Drives and power systems", 6th edition, Pearson Education, 2015
5. N.K. De., P.K. SEN "Electric drives" PHI, 2012.

19153C62**PROTECTION AND SWITCHGEAR**

L	T	P	C
4	0	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- | Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- | Characteristics and functions of relays and protection schemes.
- | Apparatus protection, static and numerical relays
- | Functioning of circuit breaker

UNIT I PROTECTION SCHEMES**9**

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS**9**

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION**9**

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION**9**

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS**9**

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF₆, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Electromagnetic and Static Relays.
- || Ability to suggest suitability circuit breaker.
- || Ability to find the causes of abnormal operating conditions of the apparatus and system.

- || Ability to analyze the characteristics and functions of relays and protection schemes.
- || Ability to study about the apparatus protection, static and numerical relays.
- || Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age InternationalPvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition,Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., NewDelhi, 2009.
5. VK Metha," Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani,'Protection and Switchgear' Oxford University Press, 2011.

19153C63**EMBEDDED SYSTEMS**

L	T	P	C
4	0	0	4

OBJECTIVES

To impart knowledge on the following Topics

- | Building Blocks of Embedded System
- | Various Embedded Development Strategies
- | Bus Communication in processors, Input/output interfacing.
- | Various processor scheduling algorithms.
- | Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication– synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Embedded systems.
- || Ability to suggest an embedded system for a given application.
- || Ability to operate various Embedded Development Strategies
- || Ability to study about the bus Communication in processors.
- || Ability to acquire knowledge on various processor scheduling algorithms.
- || Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010
2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013
3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

19153L66**POWER ELECTRONICS AND DRIVES LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter

- 8 IGBT based three phase PWM inverter
- 9 AC Voltage controller
- 10 Switched mode power converter.
- 11 Simulation of PE circuits (1 Φ & 3 Φ semi converters, 1 Φ & 3 Φ full converters, DC-DC converters, AC voltage controllers).
- 12 Characteristics of GTO & IGCT.
- 13 Characteristics of PMBLDC motor

TOTAL: 60 PERIODS

OUTCOMES:

- || Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- || Ability to experiment about switching characteristics various switches.
- || Ability to analyze about AC to DC converter circuits.
- || Ability to analyze about DC to AC circuits.
- || Ability to acquire knowledge on AC to AC converters
- || Ability to acquire knowledge on simulation software.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Device characteristics(for SCR, MOSFET, TRIAC,GTO,IGCT and IGBT kit with built-in / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter module/Discrete Component – 2
5. IGBT based three phase PWM inverter module/Discrete Component – 2
6. Switched mode power converter module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module – 1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer – 5
12. Single phase Auto transformer –3
13. Components (Inductance, Capacitance) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tabilitys – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

19153L67

**MICROPROCESSORS AND MICROCONTROLLERS
LABORATORY**

**L T P C
0 0 3 2**

OBJECTIVES:

- || To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.
- || To simulate various microprocessors and microcontrollers using KEIL or Equivalent simulator.

LIST OF EXPERIMENTS

- 1 Simple arithmetic operations: addition / subtraction / multiplication / division.
- 2 Programming with control instructions:
 - (i) Ascending / Descending order, Maximum / Minimum of numbers. (ii) Programs using Rotate instructions.
 - (iii) Hex / ASCII / BCD code conversions.
- 3 Interface Experiments: with 8085
 - (i) A/D Interfacing. & D/A Interfacing.
- 4 Traffic light controller.
- 5 I/O Port / Serial communication
- 6 Programming Practices with Simulators/Emulators/open source
- 7 Read a key ,interface display
- 8 Demonstration of basic instructions with 8051 Micro controller execution, including: (i) Conditional jumps & looping
 - (ii) Calling subroutines.
- 9 Programming I/O Port and timer of 8051 (i) study on interface with A/D & D/A
 - (ii) Study on interface with DC & AC motors
- 10 Application hardware development using embedded processors.

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand and apply computing platform and software for engineering problems.
- || Ability to programming logics for code conversion.
- || Ability to acquire knowledge on A/D and D/A.
- || Ability to understand basics of serial communication.
- || Ability to understand and impart knowledge in DC and AC motor interfacing.
- || Ability to understand basics of software simulators.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power Supply	15
2.	8051 Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

19153MP68**MINI PROJECT****LT P C****0042****OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

19153C71

HIGH VOLTAGE ENGINEERING

L	T	P	C
4	0	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- || Various types of over voltages in power system and protection methods.
- || Generation of over voltages in laboratories.
- || Measurement of over voltages.
- || Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- || Testing of power apparatus and insulation coordination

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS**9**

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN**9**

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS**9**

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS**9**

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION**9**

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of cabilities.

OUTCOMES:**TOTAL : 45 PERIODS**

- || Ability to understand Transients in power system.
- || Ability to understand Generation and measurement of high voltage.
- || Ability to understand High voltage testing.
- || Ability to understand various types of over voltages in power system.
- || Ability to measure over voltages.
- || Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, ‘High Voltage Engineering’, Tata McGraw Hill, Fifth Edition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory & Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray, 'An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

19153C72

POWER SYSTEM OPERATION AND CONTROL

L	T	P	C
4	0	0	4

OBJECTIVES:

To impart knowledge on the following topics

- | Significance of power system operation and control.
- | Real power-frequency interaction and design of power-frequency controller.
- | Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- | Economic operation of power system.
- | SCADA and its application for real time operation and control of power systems

UNIT I PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL 9

Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation - real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the day-to-day operation of electric power system.
- || Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- || Ability to understand the significance of power system operation and control.
- || Ability to acquire knowledge on real power-frequency interaction.
- || Ability to understand the reactive power-voltage interaction.
- || Ability to design SCADA and its application for real time operation

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

19153C73

RENEWABLE ENERGY SYSTEMS

L	T	P	C
4	0	0	4

OBJECTIVES:

To impart knowledge on the following Topics

- | Awareness about renewable Energy Sources and technologies. Adequate
- | inputs on a variety of issues in harnessing renewable Energy. Recognize
- | current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY 9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY 9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES 9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to create awareness about renewable Energy Sources and technologies.
- | Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- | Ability to recognize current and possible future role of renewable energy sources.
- | Ability to explain the various renewable energy resources and technologies and their applications.
 - | Ability to understand basics about biomass energy.
 - | Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis,” Engineering Applications in Sustainable Design and Development”, Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, ‘Non-conventional Energy resources’ Pearson Education ,2015.

19153L77**POWER SYSTEM SIMULATION LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide better understanding of power system analysis through digital simulation.

LIST OF EXPERIMENTS

- 1 Computation of Transmission Line Parameters
- 2 Formation of Bus Admittance and Impedance Matrices and Solution of Networks
- 3 Power Flow Analysis using Gauss-Seidel Method
- 4 Power Flow Analysis using Newton Raphson Method
- 5 Symmetric and unsymmetrical fault analysis
- 6 Transient stability analysis of SMIB System
- 7 Economic Dispatch in Power Systems
- 8 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
- 9 State estimation: Weighted least square estimation
- 10 Electromagnetic Transients in Power Systems : Transmission Line Energization

OUTCOMES:**TOTAL: 60 PERIODS**

- || Ability to understand power system planning and operational studies.
- || Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- || Ability to analyze the power flow using GS and NR method
- || Ability to find Symmetric and Unsymmetrical fault
- || Ability to understand the economic dispatch.
- || Ability to analyze the electromagnetic transients.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Personal computers (Intel i3, 80GB, 2GBRAM) – 30 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Intel i5, 80GB, 2GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software with 5 user license
6. Compilers: C, C++, VB, VC++ - 30 users

RENEWABLE ENERGY SYSTEMS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To train the students in Renewable Energy Sources and technologies.
- || To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- 1 Simulation study on Solar PV Energy System.
- 2 Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
- 3 Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
- 4 Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- 5 Simulation study on Wind Energy Generator.
- 6 Experiment on Performance assessment of micro Wind Energy Generator.
- 7 Simulation study on Hybrid (Solar-Wind) Power System.
- 8 Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- 9 Simulation study on Hydel Power.
- 10 Experiment on Performance Assessment of 100W Fuel Cell.
- 11 Simulation study on Intelligent Controllers for Hybrid Systems.

OUTCOMES:

- || Ability to understand and analyze Renewable energy systems.

TOTAL: 60 PERIODS

- || Ability to train the students in Renewable Energy Sources and technologies.
- || Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || Ability to simulate the various Renewable energy sources.
- || Ability to recognize current and possible future role of Renewable energy sources.
- || Ability to understand basics of Intelligent Controllers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the equipments / Components	Quantity Required	Remarks
1.	Personal computers (Intel i3, 80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	PV panels - 100W, 24V	1	
5.	Battery storage system with charge and discharge control 40Ah	1	
6.	PV Emulator	1	
7.	Micro Wind Energy Generator module	1	

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

19153P83PW	PROJECT WORK	L T P C
		0 0 0 15

OBJECTIVES:

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OUTCOMES:	TOTAL: 300 PERIODS
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On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

19153PEE -	PROGRAMME EXIT EXAMINATION	L T P C
		0 0 0 2

Electric Circuits and Fields:

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems:

Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines:

Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems:

Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems:

Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements:

Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics:

Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives:

Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

19153E64A**DESIGN OF ELECTRICAL APPARATUS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Magnetic circuit parameters and thermal rating of various types of electrical machines.
- | Armature and field systems for D.C. machines.
- | Core, yoke, windings and cooling systems of transformers.
- | Design of stator and rotor of induction machines and synchronous machines.
- | The importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE 9

Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage – Leakage in Armature. Design of lap winding and wave winding.

UNIT II DESIGN OF TRANSFORMERS 9

Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS 9

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizing current - Short circuit current – Circle diagram - Computer program: Design of slip-ring rotor

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field MMF – Design of field winding – Design of turbo alternators -Computer program: Design of Stator main dimensions-Brushless DC Machines

OUTCOMES: TOTAL : 45 PERIODS

- | Ability to understand basics of design considerations for rotating and static electrical machines
- | Ability to design of field system for its application.
- | Ability to design single and three phase transformer.
- | Ability to design armature and field of DC machines.
- | Ability to design stator and rotor of induction motor.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, Fifth Edition, 1984.
2. M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Lt, 2011.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, Vikas Publishing House Private Limited, 1981.
3. V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications,2008

19153E64B**POWER SYSTEM STABILITY**

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To understand the fundamental concepts of stability of power systems and its classification.
- || To expose the students to dynamic behaviour of the power system for small and large disturbances.
- || To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY 9

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies(classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation of small-signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small-signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY 9

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY 9

Factors affecting voltage stability- Classification of Voltage stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY 9

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will attain knowledge about the stability of power system
- || Learners will have knowledge on small-signal stability, transient stability and voltage stability.
- || Learners will be able to understand the dynamic behaviour of synchronous generator for different disturbances.
- || Learners will be able to understand the various methods to enhance the stability of a power system.

TEXT BOOKS:

1. Power system stability and control ,P. Kundur ; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.
2. R.Ramnujam,” Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009
3. T.V. Cutsem and C.Vournas, “Voltage Stability of Electric Power Systems”, Kluwer publishers, 1998.

REFERENCES

- 1 Peter W., Saucer, Pai M.A., “Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.
- 2 EW. Kimbark., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 2013.
- 3 SB. Crary., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 1955.
- 4 K.N. Shubhanga, “Power System Analysis” Pearson, 2017.
- 5 Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008
- 6 Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

19153E64C**MODERN POWER CONVERTERS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Switched mode power supplies
- | Matrix Converter
- | Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

OUTCOMES:

- Ability to suggest converters for AC-DC conversion and SMPS

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

19153E64D	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- 1. To give an idea about IPR, registration and its enforcement.

UNIT I	INTRODUCTION	9
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.		
UNIT II	REGISTRATION OF IPRs	10
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad		
UNIT III	AGREEMENTS AND LEGISLATIONS	10
International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.		
UNIT IV	DIGITAL PRODUCTS AND LAW	9
Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.		
UNIT V	ENFORCEMENT OF IPRs	7
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.		

TOTAL:45 PERIODS

OUTCOME:

- + | Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

19153E65A

PRINCIPLES OF ROBOTICS**L T P C**
3 0 0 3**OBJECTIVES:**

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS

9

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS

9

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS

9

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING

9

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL

9

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIOD**OUTCOMES:**

- Ability to understand basic concept of robotics.
- To analyze Instrumentation systems and their applications to various
- To know about the differential motion and statics in robotics
- To know about the various path planning techniques.
- To know about the dynamics and control in robotics industrie.

TEXT BOOKS:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2005.
2. JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. K. K.Appu Kuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, “ Embedded Systems & Robotics” – Projects using the 8051 Microcontroller”, Cengage Learning, 2009.

19153E65B**SPECIAL ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctance motors.
- Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) 9

Constructional features –Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- Ability to select a special Machine for a particular application.

TEXT BOOKS:

- K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984
- E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

19153E65C

POWER QUALITY

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Causes & Mitigation techniques of various PQ events.
- Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY**9**

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL**9**

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS**9**

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS**9**

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES**9**

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
- Ability to analyze the causes & Mitigation techniques of various PQ events.
- Ability to study about the various Active & Passive power filters.
- Ability to understand the concepts about Voltage and current distortions, harmonics.
- Ability to analyze and design the passive filters.
- Ability to acquire knowledge on compensation techniques.
- Ability to acquire knowledge on DVR.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagh, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality”, McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, “Power System Quality Assessment”, (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” Wiley, 2015.

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press), 2000.

19153E65D**EHVAC TRANSMISSION**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- EHVAC Transmission lines
- Electrostatic field of AC lines
- Corona in E.H.V. lines

- UNIT I INTRODUCTION 9**
EHVAC Transmission line trends and preliminary aspect - standard transmission voltages – Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.
- UNIT II ELECTROSTATIC FIELDS 9**
Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.
- UNIT III POWER CONTROL 9**
Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and overvoltage in EHV lines: No load voltage – Charging currents at power frequency- Voltage control – Shunt and Series compensation – Static VAR compensation.
- UNIT IV CORONA EFFECTS AND RADIO INTERFERENCE 9**
Corona in EHV lines – Corona loss formulae-Charge voltage diagram- Attenuation of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.
- UNIT V STEADY STATE AND TRANSIENT LIMITS 9**
Design of EHV lines based on steady state and transient limits - EHV capabilities and their characteristics-Introduction six phase transmission – UHV.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the principles and types of EHVAC system.
- Ability to analyze the electrostatic field of AC lines
- Ability to study about the compensation.
- Ability to study about the corona in E.H.V. lines
- Ability to understand the EHV capabilities.
- Ability to analyze the steady state and transient limits.

TEXT BOOKS:

1. Rokosh Das Begamudre, "Extra High Voltage AC Transmission Engineering"– Wiley Eastern LTD., NEW DELHI 1990.
2. S. Rao, "HVAC and HVDC Transmission, Engineering and Practice" Khanna Publisher, Delhi, 1990.

REFERENCES

1. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India Private Limited, 2013.
2. RD Begamudre, "Extra High Voltage AC Transmission Engineering"– New Academic Science Ltd; 4 edition 2011.
3. Edison, "EHV Transmission line"- Electric Institution, GEC, 1968.

19153E75A

DISASTER MANAGEMENT

L T P C

3 0 0 3

OBJECTIVES:

- | To provide students an exposure to disasters, their significance and types.
- | To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- | To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- | To enhance awareness of institutional processes in the country and
- | To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS

9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS**OUTCOMES:**

The students will be able to

- || Differentiate the types of disasters, causes and their impact on environment and society
- || Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- || Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

19153E75B**HUMAN RIGHTS****L T P C****3 0 0 3****OBJECTIVES :**

- || To sensitize the Engineering students to various aspects of Human Rights.

UNIT I**9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II**9**

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III**9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV**9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V**9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS**OUTCOME :**

- || Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

19153E75C	OPERATIONS RESEARCH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS 15

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS 6

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS 6

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS 10

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution- Linear Programming solution – Replacement models – Models based on service life – Economic life- Single / Multi variability search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of this course, the students can ability to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

1. Hillier and Libebberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.

2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

19153E75D**PROBABILITY AND STATISTICS**

L	T	P	C
3	0	0	3

OBJECTIVES :

- || This course aims at providing the required skill to apply the statistical tools in engineering problems.
- || To introduce the basic concepts of probability and random variables.
- || To introduce the basic concepts of two dimensional random variables.
- || To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- || To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES**12**

Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES**12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS**12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS**12**

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL**12**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students will be able to:

- || Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- || Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
 - || Apply the concept of testing of hypothesis for small and large samples in real life problems.
- || Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- || Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES :

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

19153E76A	SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The concept of system identification and adaptive control
- || Black-box approach based system identification
- || Batch and recursive identification
- || Computer Controlled Systems
- || Design concept for adaptive control schemes

UNIT I NON-PARAMETRIC METHODS 9

Non-parametric methods - Transient analysis - frequency analysis - Correlation analysis - Spectral analysis - Input signal design for identification

UNIT II PARAMETRIC METHODS 9

Least squares estimation – Analysis of the least squares estimate - Best linear unbiased estimate – Model parameterizations - Prediction error methods.

UNIT III RECURSIVE IDENTIFICATION METHODS 9

The recursive least square method - Model validation –Model structure determination - Introduction to closed loop system identification.

UNIT IV ADAPTIVE CONTROL SCHEMES 9

Introduction – Auto-tuning of PID controller using relay feedback approach – Types of adaptive control, Gain scheduling, Model reference adaptive control, Self-tuning controller – Design of gain scheduled adaptive controller – Applications of gain scheduling.

UNIT V MODEL-REFERENCE ADAPTIVE SYSTEM (MRAS) and SELF-TUNING REGULATOR (STR) 9

STR – Pole placement design – Indirect STR and direct STR – MRAC - MIT rule – Lyapunov theory – Relationship between MRAC and STR.

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to understand various system identification techniques and features of adaptive control like STR and MRAC.
- || Ability to understand the concept of system identification and adaptive control
- || Ability to understand about Black-box approach based system identification
- || Ability to get knowledge about batch and recursive identification
- || Ability to study about computer controlled systems
- || Ability to design concept for adaptive control schemes

TEXT BOOKS:

1. T. Soderstrom and PetreStoica, System Identification, Prentice Hall International (UK) Ltd. 1989
2. Karl J. Astrom and Bjorn Witten mark, Adaptive Control, Pearson Education, Second edition, Fifth impression, 2009.

REFERENCES

- 1 L. Ljung, System Identification - Theory for the User, 2nd edition, PTR Prentice Hall, Upper Saddle River, N.J., 1999.
- 2 K. S. Narendra and A. M. Annaswamy, Stability Adaptive Systems, Prentice-Hall, 1989.
- 3 H. K. Khalil, Nonlinear Systems, Prentice Hall, 3rd edition, 2002.
- 4 William S. Levine, "Control Systems Advanced Methods, the Control Handbook, CRC Press 2011.
- 5 S. Sastry and M. Bodson, Adaptive Control, Prentice-Hall, 1989

19153E76B**CONTROL OF ELECTRICAL DRIVES**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | To understand the DC drive control.
- | To study and analyze the Induction motor drive control.
- | To study and understand the Synchronous motor drive control.
- | To study and analyze the SRM and BLDC motor drive control.
- | To analyze and design the Digital control for drives.

UNIT I CONTROL OF DC DRIVES 9

Losses in electrical drive system, Energy efficient operation of drives, block diagram/transfer function of self, separately excited DC motors --closed loop control-speed control- current control - constant torque/power operation - P, PI and PID controllers--response comparison.

UNIT II CONTROL OF INDUCTION MOTOR DRIVE 9

VSI and CSI fed induction motor drives-principles of V/f control-closed loop variable frequency PWM inverter with dynamic braking- static Scherbius drives- power factor considerations- modified Kramer drives-principle of vector control- implementation-block diagram, Design of closed loop operation of V/f control of Induction motor drive systems.

UNIT III CONTROL OF SYNCHRONOUS MOTOR DRIVES 9

Open loop VSI fed drive and its characteristics--Self control--Torque control --Torque angle control --Power factor control--Brushless excitation systems--Field oriented control -- Design of closed loop operation of Self control of Synchronous motor drive systems.

UNIT IV CONTROL OF SRM AND BLDC MOTOR DRIVES 9

SRM construction - Principle of operation - SRM drive design factors-Torque controlled SRM-Block diagram of Instantaneous Torque control using current controllers and flux controllers. Construction and Principle of operation of BLDC Machine -Sensing and logic switching scheme,-Sinusoidal and trapezoidal type of Brushless dc motors – Block diagram of current controlled Brushless dc motor drive.

UNIT V DIGITAL CONTROL OF DC DRIVE 9

Phase Locked Loop and micro-computer control of DC drives--Program flow chart for constant constant torque and constant horse power operations Speed detection and current sensing circuits and feedback elements.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand various control strategies and controllers for AC and DC Motor Drive systems.

TEXT BOOKS:

1. Dubey, G.K, Power semiconductor controlled devices, Prentice Hall International New jersey, 1989.
2. R.Krishnan,, Electric Motor Drives - Modeling, Analysis and Control Prentice- Hall of India Pvt. Ltd., New Delhi, 2003.
3. Murphy, J.M.D, Turnbull F.G, Thyristor control of AC motors,, Pergamon press, Oxford, 1988.

REFERENCES

1. Bin Wu, High-Power Converters and AC Drives, Wiley-IEEE Press
2. Buxbaum, A.Schierau, and K.Staughen, A design of control systems for DC drives, Springer-Verlag, Berlin, 1990.
3. Bimal K. Bose, Modern Power Electronics and AC Drives, Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.
4. R. Krishnan, Switched Reluctance Motor Drives: Modeling, Simulation, Analysis, Design, and Applications, CRC press, 2001.
5. Werner Leonhard, Control of Electrical Drives, 3rd Edition, Springer, Sept., 2001.
6. R. Krishnan, Permanent Magnet Synchronous and Brushless DC Motor Drives, CRC press, 2001.

19153E76C**POWER SYSTEMS TRANSIENTS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Generation of switching transients and their control using circuit – theoretical concept.
- || Mechanism of lightning strokes and the production of lightning surges.
- || Propagation, reflection and refraction of travelling waves.
- || Voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY**9**

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

UNIT II SWITCHING TRANSIENTS**9**

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

UNIT III LIGHTNING TRANSIENTS**9**

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 9

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

TOTAL : 45 PERIODS

OUTCOMES:

Ability to understand and analyze switching and lightning transients.

- || Ability to acquire knowledge on generation of switching transients and their control.
- || Ability to analyze the mechanism of lightning strokes.
- || Ability to understand the importance of propagation, reflection and refraction of travelling waves.
- || Ability to find the voltage transients caused by faults.
- || Ability to understand the concept of circuit breaker action, load rejection on integrated power system.

TEXT BOOKS:

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter Science, New York, 2nd Edition, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., Second Edition, 2009.
3. C.S. Indulkar, D.P.Kothari, K. Ramalingam, 'Power System Transients – A statistical approach', PHI Learning Private Limited, Second Edition, 2010.

REFERENCES

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', McGraw Hill, Fifth Edition, 2013.
2. R.D. Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.
3. Y.Hase, Handbook of Power System Engineering," Wiley India, 2012.
4. J.L.Kirtley, "Electric Power Principles, Sources, Conversion, Distribution and use," Wiley, 2012.
5. Akihiro ametani," Power System Transient theory and applications", CRC press, 2013.

19153E76D	TOTAL QUALITY MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES 9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal –

Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation— Documentation— Internal Audits—Registration—**ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001— Benefits of EMS.**

TOTAL: 45 PERIODS**OUTCOME:**

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

- Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

- James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
- Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
- Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
- ISO9001-2015 standards

19153E81A	FLEXIBLE AC TRANSMISSION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The start-of-art of the power system
- || Performance of power systems with FACTS controllers.
- || FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION 9

Real and reactive power control in electrical power transmission lines–loads & system compensation–Uncompensated transmission line–shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–TCR-FC-TCR-Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability – Steady state power transfer –Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability-prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies- Dynamic voltage restorer(DVR).

UNIT V ADVANCED FACTS CONTROLLERS 9

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to understand, analyze and develop analytical model of FACTS controller for power system application.
- || Ability to understand the concepts about load compensation techniques.
- || Ability to acquire knowledge on facts devices.
- || Ability to understand the start-of-art of the power system
- || Ability to analyze the performance of steady state and transients of facts controllers.
- || Ability to study about advanced FACTS controllers.

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEE press andJohnWiley&Sons,Inc,2002.
2. NarainG. Hingorani, “Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors,Delhi-110006,2011.
3. T.J.E Miller, Power Electronics in power systems, John Wiley and sons.

REFERENCES

1. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
2. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood, HVDC and FACTS controllers–Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.

SOFT COMPUTING TECHNIQUES

L	T	P	C
3	0	0	3

19153E81B**OBJECTIVES:** To impart knowledge about the following topics:

- || Basics of artificial neural network.
- || Concepts of modelling and control of neural and fuzzy control schemes.
- || Features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

UNIT III FUZZY SET THEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarization with ANFIS toolbox.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- | Ability to understand the basics of artificial neural network.
- | Ability to get knowledge on modelling and control of neural.

- | Ability to get knowledge on modelling and control of fuzzy control schemes.
- | Ability to acquire knowledge on hybrid control schemes.
- | Ability to understand the concepts of Adaptive Resonance Theory

TEXT BOOKS:

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

REFERENCES

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)”, MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, “Fuzzy Modeling and Fuzzy Control Series: Control Engineering”, 2006

19153E81C	SMPS AND UPS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Modern power electronic converters and its applications in electric power utility.
- | Resonant converters and UPS

UNIT I DC-DC CONVERTERS 9

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II SWITCHED MODE POWER CONVERTERS 9

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III RESONANT CONVERTERS 9

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V POWER CONDITIONERS, UPS & FILTERS 9

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL : 45 PERIODS

OUTCOMES:

- | Ability to analyze the state space model for DC – DC converters
- | Ability to acquire knowledge on switched mode power converters.
- | Ability to understand the importance of Resonant Converters.
- | Ability to analyze the PWM techniques for DC-AC converters
- | Ability to acquire knowledge on modern power electronic converters and its applications in electric power utility.
- | Ability to acquire knowledge on filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

REFERENCES

1. Philip T Krein, "Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters,

- Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
 4. Erickson, Robert W, “Fundamentals of Power Electronics”, Springer, second edition, 2010.

19153E81D	ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- To study the generation, conservation of electrical power and energy efficient equipments.
- To understand the principle, design of illumination systems and energy efficiency lamps.
- To study the methods of industrial heating and welding.
- To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS

OUTCOMES:

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.
- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

19153E82A**ENERGY MANAGEMENT AND AUDITING**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | To impart concepts behind economic analysis and Load management.
- | Energy management on various electrical equipments and metering.
- | Concept of lighting systems and cogeneration.

UNIT I INTRODUCTION 9

Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targeting and reporting - Energy audit process.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION 9

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III LIGHTING SYSTEMS 9

Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS 9

Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the basics of Energy audit process.
- || Ability to understand the basics of energy management by cogeneration
- || Ability to acquire knowledge on Energy management in lighting systems
- || Ability to impart concepts behind economic analysis and Load management.
- || Ability to understand the importance of Energy management on various electrical equipment and metering.
- || Ability to acquire knowledge on HVAC.

TEXT BOOKS:

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists,.Logman Scientific & Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
5. National Productivity Council Guide Books

19153E82B HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- | Planning of DC power transmission and comparison with AC power transmission.
- | HVDC converters.
- | HVDC system control.
- | Harmonics and design of filters.
- | Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems–HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy–Firing angle control– Current and extinction angle control–Starting and stopping of DC link –Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis –case study

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to understand the principles and types of HVDC system.
- || Ability to analyze and understand the concepts of HVDC converters.
- || Ability to acquire knowledge on DC link control.
- || Ability to understand the concepts of reactive power management, harmonics and power flow analysis.
- || Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- || Ability to understand the importance of power flow in HVDC system under steady state.

TEXT BOOKS:

1. Padiyar,K.R.,“HVDC power transmission system”, New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,“High Voltage Direct Current Transmission”, Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.,“ Power System Stability and Control”, McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG,“ High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Edward Wilson Kimbark,“ Direct Current Transmission”, Vol.I, Wiley inter science, New York, London, Sydney,1971.

19153E82C

SMART GRID

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Smart Grid technologies, different smart meters and advanced metering infrastructure.
- || The power quality management issues in Smart Grid.
- || The high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID

9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES

9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE

9

IntroductiontoSmartMeters,AdvancedMeteringinfrastructure(AMI)driversandbenefits,AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED)&their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID**9**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS**9**

Local Area Network(LAN), House Area Network(HAN), Wide Area Network(WAN), Broad band over Power line(BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- | Learners will study about different Smart Grid technologies.
- | Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- | Learners will have knowledge on power quality management in Smart Grids
- | Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS:

1. Stuart Borlase “Smart Grid: Infrastructure, Technology and Solutions”, CRC Press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley 2012.

REFERENCES

- | Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication Technologies and Standards” IEEE Transactions On Industrial Informatics, Vol.7, No.4, November 2011.
- | Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey”, IEEE Transaction on Smart Grids, vol.14, 2012.
- | James Momohe “Smart Grid: Fundamentals of Design and Analysis”, Wiley-IEEE Press, 2012.

19153E82D BIOMEDICAL INSTRUMENTATION**L T P C****3 0 0 3****OBJECTIVES:**

- | To introduce fundamentals of Biomedical Engineering
- | To study the communication mechanics in a biomedical system with few examples
- | To study measurement of certain important electrical and non-electrical parameters
- | To understand the basic principles in imaging techniques
- | To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

OUTCOMES: TOTAL : 45 PERIODS

- || Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- || Ability to provide latest ideas on devices of non-electrical devices.
- || Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- || Ability to understand the analysis systems of various organ types.
- || Ability to bring out the important and modern methods of imaging techniques and their analysis.
- || Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, JohnWiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.



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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING

PROGRAM HANDBOOK

B.TECH FULLTIME
ELECTRICAL & ELECTRONICS ENGINEERING

[REGULATION 2020]

[for candidates admitted to B.Tech EEE program from June 2020 onwards]

COURSE STRUCTURE

B.TECH-EEE

R 2020

B.TECH (FT) EEE [REGULATION 2020]

SEMESTER I

S.No	Course Code	Course Name	L	T	P	C
1	20147S11	Communicative English	2	0	0	2
2	20148S12	Engineering Mathematics-I	3	1	0	4
3	20149S13	Engineering Physics	2	1	0	3
4	20149S14	Engineering Chemistry	2	1	0	3
5	20154S15	Engineering Graphics	1	0	4	3
6	20150S16	Problem Solving and Basics of Python programming	3	0	0	3
PRACTICAL						
7	20150L17	Problem Solving and Basics of Python programming Laboratory	0	0	4	2
8	20149L18	Physics and Chemistry Laboratory	0	0	4	2
TOTAL CREDITS						22
AUDIT COURSE						
9	201AGIT	Induction Training Programme				2

SEMESTER II

S.No	Course Code	Course Name	L	T	P	C
1	20147S21	Technical English	2	0	0	2
2	20148S22	Engineering Mathematics –II	3	1	0	4
3	20149S23B	Physics for Electronics Engineering	3	0	0	3
4	20149S24A	Environmental Science and Engineering	3	0	0	3
5	20153S25C	Circuit Theory	2	1	0	3
6	20154S26C	Basic Civil and Mechanical Engineering	4	0	0	4
PRACTICAL						
7	20154L27	Engineering Practices Laboratory	1	0	4	3
8	20153L28C	Electric Circuits Laboratory	0	0	4	2
TOTAL CREDITS						24
AUDIT COURSE						
1	201AGIC	Indian Constitution				2
SOFT SKILL COURSE						
2	201ASBE	Basic Behavioral Etiquette				2

SEMESTER III

S.No	Course Code	Course Name	L	T	P	C
1	20148S31C	Transforms and Partial Differential Equations	3	1	0	4
2	20153S32	Digital Logic Circuits	2	2	0	3
3	20153C33	Electromagnetic Theory	2	2	0	3
4	20153C34	Electrical Machines-I	2	2	0	3
5	20153C35	Electron Devices and Circuits	3	0	0	3
6	20153C36	Power Plant Engineering	3	0	0	3
PRACTICAL						
7	20153L37	Electronics Laboratory	0	0	4	2
8	20153L38	Electrical Machines Laboratory-I	0	0	4	2
9	201AGGS	Introduction to Gender studies				2
TOTAL CREDITS						23

SEMESTER IV

S.No	Course Code	Course Name	L	T	P	C
1	20148S41C	Numerical Methods	3	1	0	4
2	20153C42	Electrical Machines –II	2	2	0	3
3	20153C43	Transmission and Distribution	3	0	0	3
4	20153C44	Measurements and Instrumentation	3	0	0	3
5	20153C45	Linear Integrated Circuits and Applications	3	0	0	3
6	20153C46	Control Systems	3	2	0	4
PRACTICAL						
7	20153L47	Electrical Machines Laboratory-II	0	0	4	2
8	20153L48	Linear and Digital Integrated Circuits Laboratory	0	0	4	2
9	20153L49	Technical Seminar	0	0	2	1
10	201AGCE	Community Engagement				2
11	201ASGS	Technical, General Aptitude and Skill set Development				2
TOTAL CREDITS						25

SEMESTER V

S.No	Course Code	Course Name	L	T	P	C
1	20153C51	Power System Analysis	3	0	0	3
2	20153C52	Microprocessors and Microcontrollers	3	0	0	3
3	20153C53	Power Electronics	3	0	0	3
4	201__OE54_	OPEN Elective-I	3	0	0	3
5	20153S55	Digital Signal Processing	2	2	0	3
6	20153S56	Object Oriented Programming	3	0	0	3
PRACTICAL						
7	20153L57	Control and Instrumentation Laboratory	0	0	4	2
8	20153L58	Object Oriented Programming Laboratory	0	0	4	2
9	20153L59	Professional Communication	0	0	2	1
RESEARCH SKILL DEVELOPMENT(RSD)COURSE						
10	201AGIE	Innovation and Entrepreneurship				2
TOTAL CREDITS						23

SEMESTER –VI

S.No	Course Code	Course Name	L	T	P	C
1	20153C61	Solid State Drives	3	0	0	3
2	20153C62	Protection and Switchgear	3	0	0	3
3	20153S63	Embedded Systems	3	0	0	3
4	20153E64_	Elective –I	3	0	0	3
5	20153E65_	Elective –II	3	0	0	3
PRACTICAL						
6	20153L66	Power Electronics and Drives Laboratory	0	0	4	2
7	20153L67	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8	20153MP68	Mini Project	-	-	4	2
RESEARCH SKILL DEVELOPMENT (RSD) COURSE						
9	201ASTT	Technical Training				2
TOTAL CREDITS						21

SEMESTER –VII

S.No	Course Code	Course Name	L	T	P	C
1	20153C71	High Voltage Engineering	3	0	0	3
2	20153C72	Power System Operation and Control	3	0	0	3
3	20153C73	Renewable Energy Systems	3	0	0	3
4	201__OE74_	OPEN Elective –II	3	0	0	3
5	20153E75_	Elective –III	3	0	0	3
6	20153E76_	Elective –IV	3	0	0	3
PRACTICAL						
7	20153L77	Power System Simulation Laboratory	0	0	4	2
8	20153L78	Renewable Energy Systems Laboratory	0	0	4	2
TOTAL CREDITS						22

SEMESTER –VIII

S.No	Course Code	Course Name	L	T	P	C
1	20153E81_	Elective –V	3	0	0	3
2.	20153E82_	Elective –VI	3	0	0	3
PRACTICAL						
3.	20153P83	Project Work	0	0	12	6
4.	201AGPE	Professional Ethics and Human Values				2
5.	201ASIM	Interview Skills Training and Mock Test				2
TOTAL CREDITS						12
TOTAL NO.OF CREDITS=172						

**-Experiential based learning courses (Theory)

##-Highly Significant Laboratory Courses (Practical)

HoD

Dean of Academic Affairs

DEAN

LIST OF ELECTIVES

ELECTIVE –I (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E64A	Advanced Control System	3	0	0	3
2.	20153E64B	Visual Languages and Applications	3	0	0	3
3.	20153E64C	Design of Electrical Apparatus	3	0	0	3
4.	20153E64D	Power Systems Stability	3	0	0	3
5.	20153E64E	Modern Power Converters	3	0	0	3
6.	20153E64F	Intellectual Property Rights	3	0	0	3

ELECTIVE–II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E65A	Principles of Robotics	3	0	0	3
2.	20153E65B	Special Electrical Machines	3	0	0	3
3.	20153E65C	Power Quality	3	0	0	3
4.	20153E65D	EHVAC Transmission	3	0	0	3
5.	20153E65E	Communication Engineering	3	0	0	3

ELECTIVE –III (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	20153E75A	Disaster Management	3	0	0	3
2	20153E75B	Human Rights	3	0	0	3
3	20153E75C	Operations Research	3	0	0	3
4	20153E75D	Probability and Statistics	3	0	0	3
5.	20153E75E	Fiber Optics and Laser Instrumentation	3	0	0	3

ELECTIVE –IV (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E76A	System Identification and Adaptive Control	3	0	0	3
2.	20153E76B	Computer Architecture	3	0	0	3
3.	20153E76C	Control of Electrical Drives	3	0	0	3
4.	20153E76D	VLSI Design	3	0	0	3
5.	20153E76E	Power Systems Transients	3	0	0	3
6.	20153E76F	Total Quality Management	3	0	0	3

ELECTIVE –V (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E81A	Flexible AC Transmission Systems	3	0	0	3
2.	20153E81B	Soft Computing Techniques	3	0	0	3
3.	20153E81C	Power Systems Dynamics	3	0	0	3
4.	20153E81D	SMPS and UPS	3	0	0	3
5.	20153E81E	Electric Energy Generation, Utilization and Conservation	3	0	0	3
6.	20153E81F	Professional Ethics in Engineering	3	0	0	3
7.	20153E81G	Principles of Management	3	0	0	3

ELECTIVE –VI (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E82A	Energy Management and Auditing	3	0	0	3
2.	20153E82B	Data Structures	3	0	0	3
3.	20153E82C	High Voltage Direct Current Transmission	3	0	0	3
4.	20153E82D	Microcontroller Based System Design	3	0	0	3
5.	20153E82E	Smart Grid	3	0	0	3
6.	20153E82F	Biomedical Instrumentation	3	0	0	3
7.	20153E82G	Fundamentals of Nano Science	3	0	0	3

FREE ELECTIVE (V SEM)

S.No	Course Code	Course Name	L	T	P	C
1	20150FE54A	Database Management System	3	0	0	3
2	20152FE54A	Basics of Biomedical Instrumentation	3	0	0	3
3	20154FE54A	Renewable Energy Sources	3	0	0	3
4	20155FE54A	Air Pollution and Control Engineering	3	0	0	3
5	20150FE54B	Cloud computing	3	0	0	3
6	20152FE54B	Sensors and Transducers	3	0	0	3
7	20154FE54B	Automatic System	3	0	0	3
8	20155FE54B	Geographic Information System	3	0	0	3

FREE ELECTIVE (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	20150FE74A	Introduction to C Programming	3	0	0	3
2	20152FE74A	Robotics	3	0	0	3
3	20154FE74A	Industrial safety	3	0	0	3
4	20155FE74A	Green Building Design	3	0	0	3
5	20150FE74B	Datastructures and Algorithms	3	0	0	3
6	20152FE74B	Electronic Devices	3	0	0	3
7	20154FE74B	Testing of Materials	3	0	0	3
8	20155FE74B	Waste water Treatment	3	0	0	3

HoD

DEAN E&T

DEAN ACADEMICS

VICE CHANCELLOR

20147S11

COMMUNICATIVE ENGLISH

L	T	P	C
5	1	0	4

OBJECTIVES:

- | To develop the basic reading and writing skills of first year engineering and technology students.
- | To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- | To help learners develop their speaking skills and speak fluently in real contexts.
- | To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations- fixed and semi-fixed expressions

REFERENCES

- 1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
- 2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skills for Business English**. Cambridge University Press, Cambridge: Reprint 2011
- 3 Dutt P. Kiranmai and Rajeevan Geeta. **Basic Communication Skills**, Foundation Books: 2013
- 4 Means, L. Thomas and Elaine Langlois. **English & Communication For Colleges**. Cengage Learning, USA: 2007
- 5 Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005

20148S12	ENGINEERING MATHEMATICS - I	L	T	P	C
		5	1	0	4

OBJECTIVES :

The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogeneous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- || Use both the limit definition and rules of differentiation to differentiate functions.
- || Apply differentiation to solve maxima and minima problems.
- || Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- || Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- || Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- || Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- || Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

20149S13

ENGINEERING PHYSICS

L	T	P	C
5	1	0	4

OBJECTIVES

:

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle -types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL : 45 PERIODS**OUTCOMES:**

Upon completion of this course,

- ☐ the students will gain knowledge on the basics of properties of matter and its applications,
- ☐ the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- ☐ the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- ☐ the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- ☐ the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

20149S14**ENGINEERING CHEMISTRY****L T P C
5 1 0 4****OBJECTIVES:**

- | To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- | To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- | Preparation, properties and applications of engineering materials.
- | Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- | Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- || The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

20154S15**ENGINEERING GRAPHICS****LT P C
5 1 0 4****OBJECTIVES:**

- || To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- || To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- | familiarize with the fundamentals and standards of Engineering graphics
- | perform freehand sketching of basic geometrical constructions and multiple views of objects.
- | project orthographic projections of lines and plane surfaces.
- | draw projections and solids and development of surfaces.
- | visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. S. M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

20150S16**PROBLEM SOLVING AND PYTHON PROGRAMMING****L T P C****5 1 0 4****COURSE OBJECTIVES:**

- | To know the basics of algorithmic problem solving
- | To read and write simple Python programs.
- | To develop Python programs with conditionals and loops.
- | To define Python functions and call them.
- | To use Python data structures -- lists, tuples, dictionaries.
- | To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING**9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS**9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS**9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES**9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES**9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Develop algorithmic solutions to simple computational problems
- || Read, write, execute by hand simple Python programs.
- || Structure simple Python programs for solving problems.
- || Decompose a Python program into functions.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

20150L17	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	LTPC 0032
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COURSE OBJECTIVES:

- | To write, test, and debug simple Python programs.
- | To implement Python programs with conditionals and loops.
- | Use functions for structuring Python programs.
- | Represent compound data using Python lists, tuples, dictionaries.
- | Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:**Upon completion of the course, students will be able to**

- | Write, test, and debug simple Python programs.
- | Implement Python programs with conditionals and loops.
- | Develop Python programs step-wise by defining functions and calling them.
- | Use Python lists, tuples, dictionaries for representing compound data.
- | Read and write data from/to files in Python.

TOTAL :60 PERIODS

20149L18

PHYSICS AND CHEMISTRY LABORATORY
 (Common to all branches of B.E. / B.Tech Programmes)

L	T	P	C
0	0	3	2

OBJECTIVES:

- | To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

OUTCOMES:

Upon completion of the course, the students will be able to

TOTAL: 30 PERIODS

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be**conducted) OBJECTIVES:**

- | To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- | To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

- | The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30**PERIODS TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

20147S21

TECHNICAL ENGLISH**L T P C****OBJECTIVES: The Course prepares second semester engineering and Technology students to: 0 4**

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals-newspapers- **Writing-** purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary
Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-**Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;
Writing-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-**Vocabulary Development-** verbal analogies **Language Development-** reported speech

TOTAL : 60 PERIODS**OUTCOMES: At the end of the course learners will be able to:**

- || Read technical texts and write area- specific texts effortlessly.
- || Listen and comprehend lectures and talks in their area of specialisation successfully.
- || Speak appropriately and effectively in varied formal and informal contexts.
- || Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

20148S22A**ENGINEERING MATHEMATICS – II**

L	T	P	C
5	1	0	4

OBJECTIVES :

This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS**12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS**12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = cz + c, cz, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series
 – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals
 – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

OUTCOMES :**TOTAL: 60 PERIODS**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- | Gradient, divergence and curl of a vector point function and related identities.
- | Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- | Analytic functions, conformal mapping and complex integration.
- | Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics ", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

20149S23B

PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
5	1	0	3

(Common to BME, ME, CC, ECE, EEE, E&I, ICE)

OBJECTIVES:**OBJECTIVES:**

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO-ELECTRONIC DEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the students will able to

- gain knowledge on classical and quantum electron theories, and energy band structures,
- acquire knowledge on basics of semiconductor physics and its applications in various devices,
- get knowledge on magnetic and dielectric properties of materials,
- have the necessary understanding on the functioning of optical materials for optoelectronics,
- understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding Small Systems". CRC Press, 2014

20149S24A**ENVIRONMENTAL SCIENCE AND ENGINEERING****L T P C****5 1 0 4****OBJECTIVES:**

- | To study the nature and facts about environment.
- | To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- | To study the interrelationship between living organism and environment.
- | To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- | To study the dynamic processes and understand the features of the earth's interior and surface.
- | To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- || Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- || Public awareness of environmental is at infant stage.
- || Ignorance and incomplete knowledge has lead to misconceptions
- || Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

20153S25C

CIRCUIT THEORY

L	T	P	C
5	1	0	4

OBJECTIVES:

- | To introduce electric circuits and its analysis
- | To impart knowledge on solving circuit equations using network theorems
- | To introduce the phenomenon of resonance in coupled circuits.
- | To educate on obtaining the transient response of circuits.
- | To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

OUTCOMES:**TOTAL : 60 PERIODS**

- | Ability to analyse electrical circuits
- | Ability to apply circuit theorems
- | Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. ME Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi,

- 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
 6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
 7. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

20154S26C BASIC CIVIL AND MECHANICAL ENGINEERING L T P C
5 1 0 4

OBJECTIVES:

- | To impart basic knowledge on Civil and Mechanical Engineering.
- | To familiarize the materials and measurements used in Civil Engineering.
- | To provide the exposure on the fundamental elements of civil engineering structures.
- | To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

A – OVER VIEW

UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 10

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society – Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

**B – CIVIL
ENGINEERING**

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 10

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber - modern materials

UNIT III BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING**UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 15**

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system– Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES:**TOTAL: 60 PERIODS**

On successful completion of this course, the student will be able to

- | appreciate the Civil and Mechanical Engineering components of Projects.
- | explain the usage of construction material and proper selection of construction materials.
- | measure distances and area by surveying
- | identify the components used in power plant cycle.
- | demonstrate working principles of petrol and diesel engine.
- | elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd. 1999.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. ShanthaKumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.

20154L27 ENGINEERING PRACTICES LABORATORY L T P C**0 0 3 2****OBJECTIVES:**

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE 13****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
 - (b) Study of pipe connections requirements for pumps and turbines.
 - (c) Preparation of plumbing line sketches for water supply and sewage works. (d)
- Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture. (b)
- Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 18**Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. (b)
- Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
 - (b) Model making – Trays and funnels. (c)
- Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE 13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

OUTCOMES:

On successful completion of this course, the student will be able to

TOTAL: 60 PERIODS

- | fabricate carpentry components and pipe connections including plumbing works.
- | use welding equipments to join the structures.
- | Carry out the basic machining operations
- | Make the models using sheet metal works
- | Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- | Carry out basic home electrical works and appliances
- | Measure the electrical quantities
- | Elaborate on the components, gates, soldering practices.

CIVIL**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- | | | |
|---|----------|-----|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. | |
| 2. Carpentry vice (fitted to work bench) | 15 Nos. | |
| 3. Standard woodworking tools | 15 Sets. | |
| 4. Models of industrial trusses, door joints, furniture joints | 5 each | |
| 5. Power Tools: (a) Rotary Hammer | 2 Nos | |
| (b) Demolition Hammer | 2 Nos | (c) |
| Circular Saw | 2 Nos | (d) |
| Planer | 2 Nos | (e) |
| Hand Drilling Machine | 2 Nos | (f) |
| Jigsaw | 2 Nos | |

MECHANICAL

- | | |
|---|-----------|
| 1. Arc welding transformer with cables and holders | 5 Nos. |
| 2. Welding booth with exhaust facility | 5 Nos. |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos. |
| 5. Centre lathe | 2 Nos. |
| 6. Hearth furnace, anvil and smithy tools | 2 Sets. |
| 7. Moulding table, foundry tools | 2 Sets. |
| 8. Power Tool: Angle Grinder | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

20153L28C**ELECTRIC CIRCUITS LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- | To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- | To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.

OUTCOMES:**TOTAL: 60 PERIODS**

- | Understand and apply circuit theorems and concepts in engineering applications.
- | Simulate electric circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
- 2 Function Generator (1 MHz) - 10 Nos.
- 3 Single Phase Energy Meter - 1 No.
- 4 Oscilloscope (20 MHz) - 10 Nos.
- 5 Digital Storage Oscilloscope (20 MHz) – 1 No.
- 6 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
- 7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
- 8 Single Phase Wattmeter – 3 Nos.
- 9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
- 10 Circuit Connection Boards - 10 Nos.Necessary Quantities of Resistors,Inductors, Capacitors of various capacities (Quarter Watt to 10Watt

20149S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
	3	1	0	4

OBJECTIVES :

- || To introduce the basic concepts of PDE for solving standard partial differential equations.
- || To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- || To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- || To acquaint the student with Fourier transform techniques used in wide variety of situations.
- || To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- || Understand how to solve the given standard partial differential equations.
- || Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- || Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

20153C32**DIGITAL LOGIC CIRCUITS**

L	T	P	C
3	1	0	3

OBJECTIVES:

- | To study various number systems and simplify the logical expressions using Boolean functions
- | To study combinational circuits
- | To design various synchronous and asynchronous circuits.
- | To introduce asynchronous sequential circuits and PLDs
- | To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6+6

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 6+6

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6+6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

OUTCOMES:

TOTAL : 60PERIODS

- | Ability to design combinational and sequential Circuits.
- | Ability to simulate using software package.
- | Ability to study various number systems and simplify the logical expressions using Boolean functions
- | Ability to design various synchronous and asynchronous circuits.
- | Ability to introduce asynchronous sequential circuits and PLDs
- | Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES

1. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
3. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
4. Charles H.Roth, Jr, Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon, 'Digital circuits and Design',Pearson Education, 2016.

20153C33

ELECTROMAGNETIC THEORY

L	T	P	C
2	2	0	3

OBJECTIVES:

- | To introduce the basic mathematical concepts related to electromagnetic vector fields
- | To impart knowledge on the concepts of
 - | Electrostatic fields, electrical potential, energy density and their applications.
 - | Magneto static fields, magnetic flux density, vector potential and its applications. Different methods of emf generation and Maxwell's equations
 - | Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I 6+6

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II ELECTROSTATICS – II**6+6**

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS**6+6**

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS**6+6**

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES**6+6**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

TOTAL : 60 PERIODS**OUTCOMES:**

- || Ability to understand the basic mathematical concepts related to electromagnetic vector fields.
- || Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
- || Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
- || Ability to understand the different methods of emf generation and Maxwell's equations
- || Ability to understand the basic concepts electromagnetic waves and characterizing parameters
- || Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2014.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010

REFERENCES

1. V.V.Sarwate, 'Electromagnetic fields and waves', First Edition, Newage Publishers, 1993.
2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), McGraw Hill, 2010.
4. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2012.
5. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Eighth Reprint : 2015

20153C34

ELECTRICAL MACHINES – I

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | Magnetic-circuit analysis and introduce magnetic materials
- | Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- | Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- | Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- | Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation-commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne's test and Hopkinson's test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:**TOTAL : 60 PERIODS**

- | Ability to analyze the magnetic-circuits.
- | Ability to acquire the knowledge in constructional details of transformers.
- | Ability to understand the concepts of electromechanical energy conversion.
- | Ability to acquire the knowledge in working principles of DC Generator.
- | Ability to acquire the knowledge in working principles of DC Motor
- | Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., 'Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rd Edition, 2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

20153C35**ELECTRON DEVICES AND CIRCUITS****L T P C****3 0 0 3****OBJECTIVES:****The student should be made to:**

- | Understand the structure of basic electronic devices.
- | Be exposed to active and passive circuit elements.
- | Familiarize the operation and applications of transistor like BJT and FET.
- | Explore the characteristics of amplifier gain and frequency response.
- | Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS AND THYRISTORS**9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers – Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

OUTCOMES:**TOTAL : 45 PERIODS**

Upon Completion of the course, the students will be able to:

- || Explain the structure and working operation of basic electronic devices.
- || Able to identify and differentiate both active and passive elements
- || Analyze the characteristics of different electronic devices such as diodes and transistors
- || Choose and adapt the required components to construct an amplifier circuit.
- || Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. . David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”, 7th Ed., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2020.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002.
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.

20153C36

POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor (BWR)*, *Pressurized Water Reactor (PWR)*, *CANada Deuterium-Uranium reactor (CANDU)*, Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic (SPV)*, Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

OUTCOMES:**TOTAL : 45 PERIODS****Upon the completion of this course the students will be able to**

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

- Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

- El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.

2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

20153L37**ELECTRONICS LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Realization of passive filters

OUTCOMES:

Ability to understand and analyse electronic circuits.

TOTAL: 60 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, $\pm 15V$ 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

20153L38**ELECTRICAL MACHINES LABORATORY-I**

L	T	P	C
0	0	3	2

OBJECTIVES:

- 1. To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

OUTCOMES:**TOTAL: 60 PERIODS**

- 1. Ability to understand and analyze DC Generator
- 1. Ability to understand and analyze DC Motor
- 1. Ability to understand and analyze Transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos

20149S41C**NUMERICAL METHODS**

L	T	P	C
4	0	0	4

OBJECTIVES :

- ✓ To introduce the basic concepts of solving algebraic and transcendental equations.
- ✓ To introduce the numerical techniques of interpolation in various intervals in real life situations.
- ✓ To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- ✓ To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- ✓ To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- ✓ Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- ✓ Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- ✓ Apply the numerical techniques of differentiation and integration for engineering problems.
- ✓ Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- ✓ Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

20153C42	ELECTRICAL MACHINES – II	L	T	P	C
		2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- ✓ Construction and performance of salient and non – salient type synchronous generators.
- ✓ Principle of operation and performance of synchronous motor.
- ✓ Construction, principle of operation and performance of induction machines.
- ✓ Starting and speed control of three-phase induction motors.
- ✓ Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details – Types of rotors – Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL : 60 PERIODS

OUTCOMES:

- ✓ Ability to understand the construction and working principle of Synchronous Generator
- ✓ Ability to understand MMF curves and armature windings.
- ✓ Ability to acquire knowledge on Synchronous motor.
- ✓ Ability to understand the construction and working principle of Three phase Induction Motor
- ✓ Ability to understand the construction and working principle of Special Machines
- ✓ Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition ,Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

20153C43**TRANSMISSION AND DISTRIBUTION**

L	T	P	C
3	0	0	3

OBJECTIVES:

- ✓ To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- ✓ To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- ✓ To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- ✓ To study the types, construction of cables and methods to improve the efficiency.
- ✓ To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS**9**

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABILITIES 9

Underground cabilities - Types of cabilities – Construction of single core and 3 core Cabilities - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cabilities - Grading of cabilities - Power factor and heating of cabilities– DC cabilities.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin’s Law – AC and DC distributions - Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ To understand the importance and the functioning of transmission line parameters.
- ✓ To understand the concepts of Lines and Insulators.
- ✓ To acquire knowledge on the performance of Transmission lines.
- ✓ To acquire knowledge on Underground Cabilities
- ✓ To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, ‘Power System Engineering’, Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.
3. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, ‘Power System Analysis and Design’ S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffer, ‘Electrical Power Distribution and Transmission’, Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss ‘Transmission and Distribution in Electrical Engineering’, Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, “Handbook of Electrical power Distribution,” Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, ‘Principles of power system’, S. Chand & Company Ltd, New Delhi, 2013

20153C44**MEASUREMENTS AND INSTRUMENTATION**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- ✓ Basic functional elements of instrumentation
- ✓ Fundamentals of electrical and electronic instruments
- ✓ Comparison between various measurement techniques
- ✓ Various storage and display devices
- ✓ Various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS 9

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ To acquire knowledge on Basic functional elements of instrumentation
- ✓ To understand the concepts of Fundamentals of electrical and electronic instruments
- ✓ Ability to compare between various measurement techniques
- ✓ To acquire knowledge on Various storage and display devices
- ✓ To understand the concepts Various transducers and the data acquisition systems
- ✓ Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

TEXT BOOKS:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2010.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2013.
3. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, McGraw Hill Education Pvt. Ltd., 2007.

REFERENCES

1. H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, III Edition 2010.
2. D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.
3. David Bell, 'Electronic Instrumentation & Measurements', Oxford University Press, 2013.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

20153C45	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following topics

- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- IC fabrication procedure.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers, summer, differentiator and integrator-V/I & I/V converters.

UNIT III APPLICATIONS OF OPAMP 9

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analog multiplier & Divider, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit,— D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNIT IV SPECIAL ICs 9

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V APPLICATION ICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ Ability to acquire knowledge in IC fabrication procedure
- ✓ Ability to analyze the characteristics of Op-Amp
- ✓ To understand the importance of Signal analysis using Op-amp based circuits.
- ✓ Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- ✓ To understand and acquire knowledge on the Applications of Op-amp
- ✓ Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore,"Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition,2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid,' Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

20153C46**CONTROL SYSTEMS****LT P C****3 2 0 4****COURSE OBJECTIVES**

- ✓ To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- ✓ To provide adequate knowledge in the time response of systems and steady state error analysis.
- ✓ To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- ✓ To introduce stability analysis and design of compensators

UNIT I	SYSTEMS AND REPRESENTATION	9
Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.		
UNIT II	TIME RESPONSE	9
Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.		
UNIT III	FREQUENCY RESPONSE	9
Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications		
UNIT IV	STABILITY AND COMPENSATOR DESIGN	9
Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensator using bode plots.		
UNIT V	STATE VARIABLE ANALYSIS	9
Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.		
		TOTAL (L: 45+T:30): 75 PERIODS

COURSE OUTCOMES

At the end of the course, the student should have the :

- ✓ Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
- ✓ Ability to do time domain and frequency domain analysis of various models of linear system.
- ✓ Ability to interpret characteristics of the system to develop mathematical model.
- ✓ Ability to design appropriate compensator for the given specifications.
- ✓ Ability to come out with solution for complex control problem.
- ✓ Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers, 2017.
2. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, “Modern Control Engineering”, Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and Houppis Sttuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on “Control Engineering “by Prof. S. D. Agashe, IIT Bombay.

20153L47**ELECTRICAL MACHINES LABORATORY - II**

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

- Regulation of three phase alternator by EMF and MMF methods.
- Regulation of three phase alternator by ZPF and ASA methods.
- Regulation of three phase salient pole alternator by slip test.
- Measurements of negative sequence and zero sequence impedance of alternators.
- V and Inverted V curves of Three Phase Synchronous Motor.
- Load test on three-phase induction motor.
- No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
- Separation of No-load losses of three-phase induction motor.
- Load test on single-phase induction motor.
- No load and blocked rotor test on single-phase induction motor.
- Study of Induction motor Starters

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines
- Ability to acquire knowledge on separation of losses

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Synchronous Induction motor 3HP – 1 No.
- DC Shunt Motor Coupled With Three phase Alternator – 4 nos
- DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
- Three Phase Induction Motor with Loading Arrangement – 2 nos
- Single Phase Induction Motor with Loading Arrangement – 2 nos
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Three Phase Auto Transformer – 3 nos
- Single Phase Resistive Loading Bank – 2 nos
- Three Phase Resistive Loading Bank – 2 nos
- Capacitor Bank – 1 No.

**20153L48 LINEAR AND DIGITAL INTEGRATED
CIRCUITS LABORATORY**

**L T P C
0 0 3 2**

OBJECTIVES:

- To learn design, testing and characterizing of circuit behavior with digital and analog ICs.

LIST OF EXPERIMENTS

- Implementation of Boolean Functions, Adder and Subtractor circuits.
- Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
- Parity generator and parity checking
- Encoders and Decoders
- Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
- Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
- Study of multiplexer and de multiplexer
- Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
- Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
- Voltage to frequency characteristics of NE/ SE 566 IC.
- Variability Voltage Regulator using IC LM320.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should have the :

- Ability to understand and implement Boolean Functions.
- Ability to understand the importance of code conversion
- Ability to Design and implement 4-bit shift registers
- Ability to acquire knowledge on Application of Op-Amp
- Ability to Design and implement counters using specific counter IC.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual ,(0-30V) variability Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	
6	Bread board	10	

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficient quantity)			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

20153C51

POWER SYSTEM ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- | To model the power system under steady state operating condition
- | To understand and apply iterative techniques for power flow analysis
- | To model and carry out short circuit studies on power system
- | To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off-nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to model the power system under steady state operating condition
- | Ability to understand and apply iterative techniques for power flow analysis
- | Ability to model and carry out short circuit studies on power system
- | Ability to model and analyze stability problems in power system
- | Ability to acquire knowledge on Fault analysis.
- | Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

20153C52**MICROPROCESSORS AND MICROCONTROLLERS**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | Architecture of μ P8085 & μ C 8051
- | Addressing modes & instruction set of 8085 & 8051.
- | Need & use of Interrupt structure 8085 & 8051.
- | Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms & I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- | Ability to need & use of Interrupt structure 8085 & 8051.
- | Ability to understand the importance of Interfacing
- | Ability to explain the architecture of Microprocessor and Microcontroller.
- | Ability to write the assembly language programme.
- | Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, “Microprocessor and Microcontrollers”, PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, ‘Microprocessor Architecture Programming and Application’, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely ‘The 8051 Micro Controller and Embedded Systems’, PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM,” Computer Fundamentals Architecture and Organization” New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051,McGraw Hill Edu,2013.
4. Ajay V.Deshmukh, ‘Microcontroller Theory & Applications’, McGraw Hill Edu,2016
5. Douglas V.Hall, ‘Microprocessor and Interfacing’, McGraw Hill Edu,2016.

20153C53**POWER ELECTRONICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | Different types of power semiconductor devices and their switching
- | Operation, characteristics and performance parameters of controlled rectifiers
- | Operation, switching techniques and basics topologies of DC-DC switching regulators.
- | Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- | Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters- performance parameters -Effect of source inductance- Firing Schemes for converter-Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy- Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT IV INVERTERS 0 0 9

Single phase and three phase voltage source inverters (both 120° mode and 180° mode)- Voltage & harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM - Introduction to space vector modulation -Current source inverter, Applications-Induction heating, UPS.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers-Control strategy- Power Factor Control - Multistage sequence control -single phase and three phase cyclo converters - Introduction to Matrix converters, Applications -welding .

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to analyse AC-AC and DC-DC and DC-AC converters.
- || Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCES

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal, "Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

20153C55**DIGITAL SIGNAL PROCESSING**

L	T	P	C
2	2	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Signals and systems & their mathematical representation.
- | Discrete time systems.
- | Transformation techniques & their computation. Filters and their design for digital implementation. Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION 6+6

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 6+6

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 6+6

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.

TOTAL : 60 PERIODS**OUTCOMES:**

1. Ability to understand the importance of Fourier transform, digital filters and DS Processors.
2. Ability to acquire knowledge on Signals and systems & their mathematical representation.
3. Ability to understand and analyze the discrete time systems.
4. Ability to analyze the transformation techniques & their computation.
5. Ability to understand the types of filters and their design for digital implementation.
6. Ability to acquire knowledge on programmability digital signal processor & quantization effects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman, 'Fundamentals of Digital Signal Processing', Wiley, 2013

REFERENCES

1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

20153C56 OBJECT ORIENTED PROGRAMMING L T P C 3 0 0 3

OBJECTIVES:

- | To understand Object Oriented Programming concepts and basic characteristics of Java
- | To know the principles of packages, inheritance and interfaces
- | To define exceptions and use I/O streams
- | To develop a java application with threads and generics classes
- | To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- || Develop Java programs using OOP principles
- || Develop Java programs with the concepts inheritance and interfaces
- || Build Java applications using exceptions and I/O streams
- || Develop Java applications with threads and generics classes
- || Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

20153L57**CONTROL AND INSTRUMENTATION LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

1. To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges

9. Dynamics of Sensors/Transducers

(a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f) Flow

10 Power and Energy Measurement

11 Signal Conditioning

(a) Instrumentation Amplifier

(b) Analog – Digital and Digital –Analog converters (ADC and DACs)

12 Process Simulation

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand control theory and apply them to electrical engineering problems.
- || Ability to analyze the various types of converters.
- || Ability to design compensators
- || Ability to understand the basic concepts of bridge networks.
- || Ability to the basics of signal conditioning circuits.
- || Ability to study the simulation packages.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID controller simulation and learner kit – 1 No.
2. Digital storage Oscilloscope for capturing transience- 1 No
- 2 Personal Computer with control system simulation packages - 10 Nos
3. DC motor –Generator test set-up for evaluation of motor parameters
4. CRO 30MHz – 1 No.
5. 2MHz Function Generator – 1No.
6. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
7. AC Synchro transmitter& receiver – 1No.
8. Sufficient number of Digital multi meters, speed and torque sensors

INSTRUMENTATION:

9. R, L, C Bridge kit (with manual)
10. a) Electric heater – 1No.
Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.
- b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump – 1 No. (with necessary connecting tubes)
- c) LVDT 20mm core length movability type – 1No. CRO 30MHz – 1No. d)
Optical sensor – 1 No. Light source
- e) Strain Gauge Kit with Handy lever beam – 1No.

- 100gm weights – 10 nos
 f) Flow measurement Trainer kit – 1 No.
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter
 Voltmeter Rheostat Stop watch
 Connecting wires (3/20)
 12. IC Transistor kit – 1No.
 13. Instrumentation Amplifier kit-1 No
 14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

20153L58

**OBJECT ORIENTED PROGRAMMING
 LABORATORY**

**LTP C
 0032**

COURSE OBJECTIVES

- | To build software development skills using java programming for real-world applications.
- | To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- | To develop applications using generic programming and event handling.

List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

- If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. Write a program to perform string operations using ArrayList. Write functions for the following
 - a. Append - add at end
 - b. Insert – add at particular index c.
 - Search
 - d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

COURSE OUTCOMES**TOTAL : 60 PERIODS**

- Upon completion of the course, the students will be able to
- || Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
 - || Develop and implement Java programs with arraylist, exception handling and multithreading .
 - || Design applications using file processing, generic programming and event handling.

20153L59

PROFESSIONAL COMMUNICATION**L T P C**
0 0 2 1**OBJECTIVES: The course aims to:**

- | Enhance the Employability and Career Skills of students
- | Orient the students towards grooming as a professional
- | Make them Employability Graduates
- | Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes.

TOTAL : 30 PERIODS**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. Globearna
2. Win English

REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

SOLID STATE DRIVES

L	T	P	C
3	0	0	3

20153C61**OBJECTIVES:**

To impart knowledge on the following Topics

- | Steady state operation and transient dynamics of a motor load system.
- | Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- | Operation and performance of AC motor drives.
- | Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive- Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control- Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand and suggest a converter for solid state drive.
- | Ability to select suitability drive for the given application.
- | Ability to study about the steady state operation and transient dynamics of a motor load system.
- | Ability to analyze the operation of the converter/chopper fed dc drive.
- | Ability to analyze the operation and performance of AC motor drives.
- | Ability to analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, “ Electric Drives Concepts and Applications ”, 2e, McGraw Hill, 2016

2. Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
4. Theodore Wildi, "Electrical Machines, Drives and power systems, 6th edition, Pearson Education, 2015
5. N.K. De., P.K. SEN "Electric drives" PHI, 2012.

20153C62**PROTECTION AND SWITCHGEAR**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- | Characteristics and functions of relays and protection schemes.
- | Apparatus protection, static and numerical relays
- | Functioning of circuit breaker

UNIT I PROTECTION SCHEMES**9**

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS**9**

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION**9**

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION**9**

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS**9**

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF₆, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Electromagnetic and Static Relays.
- || Ability to suggest suitability circuit breaker.
- || Ability to find the causes of abnormal operating conditions of the apparatus and system.

- || Ability to analyze the characteristics and functions of relays and protection schemes.
- || Ability to study about the apparatus protection, static and numerical relays.
- || Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age International Pvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., New Delhi, 2009.
5. VK Metha, "Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani, 'Protection and Switchgear' Oxford University Press, 2011.

20153C63

EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES

To impart knowledge on the following Topics

- | Building Blocks of Embedded System
- | Various Embedded Development Strategies
- | Bus Communication in processors, Input/output interfacing.
- | Various processor scheduling algorithms.
- | Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication– synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Embedded systems.
- || Ability to suggest an embedded system for a given application.
- || Ability to operate various Embedded Development Strategies
- || Ability to study about the bus Communication in processors.
- || Ability to acquire knowledge on various processor scheduling algorithms.
- || Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010
2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013
3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

20153L66**POWER ELECTRONICS AND DRIVES LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter

- 8 IGBT based three phase PWM inverter
- 9 AC Voltage controller
- 10 Switched mode power converter.
- 11 Simulation of PE circuits (1 Φ & 3 Φ semi converters, 1 Φ & 3 Φ full converters, DC-DC converters, AC voltage controllers).
- 12 Characteristics of GTO & IGCT.
- 13 Characteristics of PMBLDC motor

TOTAL: 60 PERIODS

OUTCOMES:

- || Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- || Ability to experiment about switching characteristics various switches.
- || Ability to analyze about AC to DC converter circuits.
- || Ability to analyze about DC to AC circuits.
- || Ability to acquire knowledge on AC to AC converters
- || Ability to acquire knowledge on simulation software.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Device characteristics(for SCR, MOSFET, TRIAC,GTO,IGCT and IGBT kit with built-in / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter module/Discrete Component – 2
5. IGBT based three phase PWM inverter module/Discrete Component – 2
6. Switched mode power converter module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module – 1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer – 5
12. Single phase Auto transformer –3
13. Components (Inductance, Capacitance) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tabilitys – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

**20153L67 MICROPROCESSORS AND MICROCONTROLLERS
LABORATORY**

**L T P C
0 0 3 2**

OBJECTIVES:

- 1 To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.
- 2 To simulate various microprocessors and microcontrollers using KEIL or Equivalent simulator.

LIST OF EXPERIMENTS

- 1 Simple arithmetic operations: addition / subtraction / multiplication / division.
- 2 Programming with control instructions:
 - (i) Ascending / Descending order, Maximum / Minimum of numbers. (ii) Programs using Rotate instructions.
 - (iii) Hex / ASCII / BCD code conversions.
- 3 Interface Experiments: with 8085
 - (i) A/D Interfacing. & D/A Interfacing.
- 4 Traffic light controller.
- 5 I/O Port / Serial communication
- 6 Programming Practices with Simulators/Emulators/open source
- 7 Read a key ,interface display
- 8 Demonstration of basic instructions with 8051 Micro controller execution, including: (i) Conditional jumps & looping
 - (ii) Calling subroutines.
- 9 Programming I/O Port and timer of 8051 (i) study on interface with A/D & D/A
 - (ii) Study on interface with DC & AC motors
- 10 Application hardware development using embedded processors.

TOTAL: 60 PERIODS

OUTCOMES:

- 1 Ability to understand and apply computing platform and software for engineering problems.
- 2 Ability to programming logics for code conversion.
- 3 Ability to acquire knowledge on A/D and D/A.
- 4 Ability to understand basics of serial communication.
- 5 Ability to understand and impart knowledge in DC and AC motor interfacing.
- 6 Ability to understand basics of software simulators.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power Supply	15
2.	8051 Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

20153MP68**MINI PROJECT****L T P C****0 0 4 2****OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

20153C71

HIGH VOLTAGE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigriff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of capability.

OUTCOMES:**TOTAL : 45 PERIODS**

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory &Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray, 'An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

20153C72

POWER SYSTEM OPERATION AND CONTROL

L T P C
3 0 0 3

OBJECTIVES:

To impart knowledge on the following topics

- | Significance of power system operation and control.
- | Real power-frequency interaction and design of power-frequency controller.
- | Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- | Economic operation of power system.
- | SCADA and its application for real time operation and control of power systems

UNIT I PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL 9

Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation - real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the day-to-day operation of electric power system.
- || Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- || Ability to understand the significance of power system operation and control.
- || Ability to acquire knowledge on real power-frequency interaction.
- || Ability to understand the reactive power-voltage interaction.
- || Ability to design SCADA and its application for real time operation

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

20153C73

RENEWABLE ENERGY SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | Awareness about renewable Energy Sources and technologies. Adequate
- | inputs on a variety of issues in harnessing renewable Energy. Recognize
- | current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY 9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY 9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES 9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications.

Energy	Storage	System-	Hybrid	Energy	Systems.
TOTAL : 45					PERIODS

OUTCOMES:

- | Ability to create awareness about renewable Energy Sources and technologies.
- | Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- | Ability to recognize current and possible future role of renewable energy sources.
- | Ability to explain the various renewable energy resources and technologies and their applications.
- | Ability to understand basics about biomass energy.
- | Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis,” Engineering Applications in Sustainable Design and Development”, Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, ‘Non-conventional Energy resources’ Pearson Education ,2015.

20153L77**POWER SYSTEM SIMULATION LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

To provide better understanding of power system analysis through digital simulation.

LIST OF EXPERIMENTS

- 1 Computation of Transmission Line Parameters
- 2 Formation of Bus Admittance and Impedance Matrices and Solution of Networks
- 3 Power Flow Analysis using Gauss-Seidel Method
- 4 Power Flow Analysis using Newton Raphson Method
- 5 Symmetric and unsymmetrical fault analysis
- 6 Transient stability analysis of SMIB System
- 7 Economic Dispatch in Power Systems
- 8 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
- 9 State estimation: Weighted least square estimation
- 10 Electromagnetic Transients in Power Systems : Transmission Line Energization

OUTCOMES:**TOTAL: 60 PERIODS**

- || Ability to understand power system planning and operational studies.
- || Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- || Ability to analyze the power flow using GS and NR method
- || Ability to find Symmetric and Unsymmetrical fault
- || Ability to understand the economic dispatch.
- || Ability to analyze the electromagnetic transients.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Personal computers (Intel i3, 80GB, 2GBRAM) – 30 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Intel i5, 80GB, 2GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software with 5 user license
6. Compilers: C, C++, VB, VC++ - 30 users

RENEWABLE ENERGY SYSTEMS LABORATORY	L	T	P	C
	0	0	3	2

OBJECTIVES:

- || To train the students in Renewable Energy Sources and technologies.
- || To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- 1 Simulation study on Solar PV Energy System.
- 2 Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
- 3 Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
- 4 Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- 5 Simulation study on Wind Energy Generator.
- 6 Experiment on Performance assessment of micro Wind Energy Generator.
- 7 Simulation study on Hybrid (Solar-Wind) Power System.
- 8 Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- 9 Simulation study on Hydrel Power.
- 10 Experiment on Performance Assessment of 100W Fuel Cell.
- 11 Simulation study on Intelligent Controllers for Hybrid Systems.

OUTCOMES:

- || Ability to understand and analyze Renewable energy systems.

TOTAL: 60 PERIODS

- || Ability to train the students in Renewable Energy Sources and technologies.
- || Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || Ability to simulate the various Renewable energy sources.
- || Ability to recognize current and possible future role of Renewable energy sources.
- || Ability to understand basics of Intelligent Controllers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the equipments / Components	Quantity Required	Remarks
1.	Personal computers (Intel i3, 80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	PV panels - 100W, 24V	1	
5.	Battery storage system with charge and discharge control 40Ah	1	
6.	PV Emulator	1	
7.	Micro Wind Energy Generator module	1	

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

17153CEC -COMPS

0 0 2 2

Electric Circuits and Fields:

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems:

Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines:

Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems:

Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems:

Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements:

Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics:

Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives:

Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

20153E64A**ADVANCED CONTROL SYSTEM****L T P C****2 2 0 3****OBJECTIVES**

- i. To provide knowledge on design state feedback control and state observer.
- ii. To provide knowledge in phase plane analysis.
- iii. To give basic knowledge in describing function analysis.
- iv. To study the design of optimal controller.
- v. To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE ANALYSIS**6+6**

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN**6+6**

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS**6+6**

Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS**6+6**

Introduction, common physical nonlinearities, The phase plane method: concepts, singular points, stability of non linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL**6+6**

Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

OUTCOMES:**TOTAL: 60 PERIODS**

- i. Able to design state feedback controller and state observer.
- ii. Able to understand and analyse linear and nonlinear systems using phase plane method.
- iii. Able to understand and analyse nonlinear systems using describing function method.
- iv. Able to understand and design optimal controller.
- v. Able to understand optimal estimator including Kalman Filter.
- vi. Ability to apply advanced control strategies to practical engineering problems.

TEXT BOOKS:

1. M.Gopal, "Digital Control and State Variable Methods", 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, 'Modern Control Engineering', 5th Edition, Pearson, 2012.
3. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

REFERENCES:

1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Taylor and Francis Group, 2011.
3. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.

20153E64B**VISUAL LANGUAGES AND APPLICATIONS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- 1 To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- 1 To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- 1 To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- 1 To study about the integrated development programming event driven programming, variabilitys, constants, procedures and basic ActiveX controls in visual basic.
- 1 To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I FUNDAMENTALS OF WINDOWS AND MFC 9

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective. The benefits of C++ and MFC - MFC design philosophy – Document / View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map. Drawing the lines – Curves – Ellipse – Polygons and other shapes. GDI pens – Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II RESOURCES AND CONTROLS 9

Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus. The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Modal dialog boxes – Modeless dialog boxes.

UNIT III DOCUMENT / VIEW ARCHITECTURE 9

The in existence function revisited – Document object – View object – Frame window object – Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document – Mid squares application – Supporting multiple document types – Alternatives to MDI. Splitter Windows: Dynamic splitter window – Static splitter windows. Creating & initializing a toolbar - Controlling the toolbar's visibility – Creating & initializing a status bar - Creating custom status bar panes – Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing – C file derivatives – Serialization basics - Writing serializability classes.

UNIT IV FUNDAMENTALS OF VISUAL BASIC 9

Menu bar – Tool bar – Project explorer – Toolbox – Properties window – Form designer – Form layout – Intermediate window. Designing the user interface: Aligning the controls – Running the application – Visual development and event driven programming.

Variabilitys: Declaration – Types – Converting variability types – User defined data types - Lifetime of a variability. Constants - Arrays – Types of arrays. Procedures: Subroutines – Functions – Calling procedures. Text box controls – List box & Combo box controls – Scroll bar and slider controls – File controls.

UNIT V DATABASE PROGRAMMING WITH VB 9

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Tablity def object, Query def object. Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

OUTCOMES:

- | Ability to understand and apply computing platform and software for engineering problems
- | Ability to study about the concepts of windows programming models.
- | Ability to study the concepts of Menu basics, menu magic and classic controls.
- | Ability to study the concept of Document/View Architecture with single & multiple document interface.
- | Ability to study about the integrated development programming event driven programming.
- | Ability to understand the database and the database management system.

TEXT BOOKS:

1. Jeff Prosize, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors (P) Ltd, Reprinted, 2002.
2. Evangelos Petroustos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFERENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, McGraw Hill, reprinted, 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', McGraw Hill, Reprinted, 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

20153E64C**DESIGN OF ELECTRICAL APPARATUS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Magnetic circuit parameters and thermal rating of various types of electrical machines.
- | Armature and field systems for D.C. machines.
- | Core, yoke, windings and cooling systems of transformers.
- | Design of stator and rotor of induction machines and synchronous machines.
- | The importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE 9

Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage – Leakage in Armature. Design of lap winding and wave winding.

UNIT II DESIGN OF TRANSFORMERS 9

Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS 9

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizing current - Short circuit current – Circle diagram - Computer program: Design of slip-ring rotor

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field MMF – Design of field winding – Design of turbo alternators -Computer program: Design of Stator main dimensions-Brushless DC Machines

OUTCOMES: TOTAL : 45 PERIODS

- || Ability to understand basics of design considerations for rotating and static electrical machines
- || Ability to design of field system for its application.
- || Ability to design single and three phase transformer.
- || Ability to design armature and field of DC machines.
- || Ability to design stator and rotor of induction motor.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, Fifth Edition, 1984.
2. M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Lt, 2011.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, Vikas Publishing House Private Limited, 1981.
3. V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications, 2008

20153E64D	POWER SYSTEM STABILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- | To understand the fundamental concepts of stability of power systems and its classification.
- | To expose the students to dynamic behaviour of the power system for small and large disturbances.
- | To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY 9

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies(classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation of small-signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small-signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY 9

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY 9

Factors affecting voltage stability- Classification of Voltage stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY 9

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Learners will attain knowledge about the stability of power system
- | Learners will have knowledge on small-signal stability, transient stability and voltage stability.
- | Learners will be able to understand the dynamic behaviour of synchronous generator for different disturbances.
- | Learners will be able to understand the various methods to enhance the stability of a power system.

TEXT BOOKS:

1. Power system stability and control ,P. Kundur ; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.
2. R.Ramnujam,” Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009
3. T.V. Cutsem and C.Vournas, “Voltage Stability of Electric Power Systems”, Kluwer publishers, 1998.

REFERENCES

- 1 Peter W., Saucer, Pai M.A., “Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.
- 2 EW. Kimbark., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 2013.
- 3 SB. Crary., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 1955.
- 4 K.N. Shubhanga, “Power System Analysis” Pearson, 2017.
- 5 Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008
- 6 Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

20153E64E**MODERN POWER CONVERTERS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Switched mode power supplies
- | Matrix Converter
- | Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

OUTCOMES:

- Ability to suggest converters for AC-DC conversion and SMPS

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

20153E64F	INTELLECTUAL PROPERTY RIGHTS	L T P C
		3 0 0 3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL:45 PERIODS

OUTCOME:

- + | Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

20153E65A**PRINCIPLES OF ROBOTICS****L T P C
3 0 0 3****OBJECTIVES:**

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS**9**

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS**9**

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS**9**

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING**9**

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL**9**

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIOD**OUTCOMES:**

- Ability to understand basic concept of robotics.
- To analyze Instrumentation systems and their applications to various
- To know about the differential motion and statics in robotics
- To know about the various path planning techniques.
- To know about the dynamics and control in robotics industrie.

TEXT BOOKS:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2005.
2. JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. K. K.Appu Kuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, “ Embedded Systems & Robotics” – Projects using the 8051 Microcontroller”, Cengage Learning, 2009.

20153E65B**SPECIAL ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- ✓ Construction, principle of operation, control and performance of stepping motors.
- ✓ Construction, principle of operation, control and performance of switched reluctance motors.
- ✓ Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- ✓ Construction, principle of operation and performance of permanent magnet synchronous motors.
- ✓ Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) 9

Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- ✓ Ability to analyze and design controllers for special Electrical Machines.
- ✓ Ability to acquire the knowledge on construction and operation of stepper motor.
- ✓ Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- ✓ Ability to construction, principle of operation, switched reluctance motors.
- ✓ Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- ✓ Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- ✓ Ability to select a special Machine for a particular application.

TEXT BOOKS:

- ✓ K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- ✓ T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984
- ✓ E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

20153E65C**POWER QUALITY**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- ✓ Causes & Mitigation techniques of various PQ events.
- ✓ Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL 9

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS 9

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ Ability to understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
- ✓ Ability to analyze the causes & Mitigation techniques of various PQ events.
- ✓ Ability to study about the various Active & Passive power filters.
- ✓ Ability to understand the concepts about Voltage and current distortions, harmonics.
- ✓ Ability to analyze and design the passive filters.
- ✓ Ability to acquire knowledge on compensation techniques.
- ✓ Ability to acquire knowledge on DVR.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granaghan, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality”, McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, “Power System Quality Assessment”, (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” Wiley, 2015.

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press), 2000.

20153E65D**EHVAC TRANSMISSION**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- ✓ EHVAC Transmission lines
- ✓ Electrostatic field of AC lines
- ✓ Corona in E.H.V. lines

UNIT I INTRODUCTION 9

EHVAC Transmission line trends and preliminary aspect - standard transmission voltages – Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

UNIT II ELECTROSTATIC FIELDS 9

Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

UNIT III POWER CONTROL 9

Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and overvoltage in EHV lines: No load voltage – Charging currents at power frequency- Voltage control – Shunt and Series compensation – Static VAR compensation.

UNIT IV CORONA EFFECTS AND RADIO INTERFERENCE 9

Corona in EHV lines – Corona loss formulae-Charge voltage diagram- Attenuation of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.

UNIT V STEADY STATE AND TRANSIENT LIMITS 9

Design of EHV lines based on steady state and transient limits - EHV capabilities and their characteristics-Introduction six phase transmission – UHV.

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ Ability to understand the principles and types of EHVAC system.
- ✓ Ability to analyze the electrostatic field of AC lines
- ✓ Ability to study about the compensation.
- ✓ Ability to study about the corona in E.H.V. lines
- ✓ Ability to understand the EHV capabilities.
- ✓ Ability to analyze the steady state and transient limits.

TEXT BOOKS:

1. Rokosh Das Begamudre, "Extra High Voltage AC Transmission Engineering"– Wiley Eastern LTD., NEW DELHI 1990.
2. S. Rao, "HVAC and HVDC Transmission, Engineering and Practice" Khanna Publisher, Delhi, 1990.

REFERENCES

1. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India Private Limited, 2013.

2. RD Begamudre, "Extra High Voltage AC Transmission Engineering" – New Academic Science Ltd; 4 edition 2011.
3. Edison," EHV Transmission line"- Electric Institution, GEC, 1968.

20153E65E

COMMUNICATION ENGINEERING

L T P C

3 0 0 3

OBJECTIVES:

- ✓ To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- ✓ To study the various analog and digital modulation techniques
- ✓ To study the principles behind information theory and coding
- ✓ To study the various digital communication techniques

UNIT I ANALOG MODULATION

9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNIT II PULSE MODULATION

9

Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL MODULATION AND TRANSMISSION

9

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING

9

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS

9

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

OUTCOMES:

At the end of the course, the student should be able to:

- ✓ Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- ✓ Apply analog and digital communication techniques.
- ✓ Use data and pulse communication techniques.
- ✓ Analyze Source and Error control coding.

TEXT BOOKS:

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems” TMH 2007
2. S. Haykin “Digital Communications” John Wiley 2005

REFERENCES:

1

- . B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University
2. H P Hsu, Schaum Outline Series – “Analog and Digital Communications” TMH 2006
3. B.Sklar, Digital Communications Fundamentals and Applications” 2/e Pearson Education 2007.

20153E75A

DISASTER MANAGEMENT**LT P C****3 0 3****OBJECTIVES:**

- | To provide students an exposure to disasters, their significance and types.
- | To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- | To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- | To enhance awareness of institutional processes in the country and
- | To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS**9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)**9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA**9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS**9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS**OUTCOMES:**

The students will be able to

- || Differentiate the types of disasters, causes and their impact on environment and society
- || Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- || Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

2015E75B**HUMAN RIGHTS****LT P C****3 0 0 3****OBJECTIVES :**

- || To sensitize the Engineering students to various aspects of Human Rights.

UNIT I**9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II**9**

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III**9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV**9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V**9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disability persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS**OUTCOME :**

- || Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

20153E75C	OPERATIONS RESEARCH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS 15

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS 6

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS 6

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS 10

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variability search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of this course, the students can ability to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

1. Hillier and Libeberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.

2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

20153E75D**PROBABILITY AND STATISTICS**

L	T	P	C
3	0	0	3

OBJECTIVES :

- | This course aims at providing the required skill to apply the statistical tools in engineering problems.
- | To introduce the basic concepts of probability and random variables.
- | To introduce the basic concepts of two dimensional random variables.
- | To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- | To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES**12**

Probability – The axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES**12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS**12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS**12**

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL**12**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students will be able to:

- || Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- || Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
 - || Apply the concept of testing of hypothesis for small and large samples in real life problems.
- || Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- || Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES :

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

20153E75E**FIBRE OPTICS AND LASER INSTRUMENTS****LT P C****3 0 0 3****AIM**

:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

COURSE OBJECTIVES

- | To expose the students to the basic concepts of optical fibres and their properties.
- | To provide adequate knowledge about the Industrial applications of optical fibres.
- | To expose the students to the Laser fundamentals.
- | To provide adequate knowledge about Industrial application of lasers.
- | To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES**9**

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fibre: Total internal reflection, Acceptance angle (θ_a), Numerical aperture and Skew mode, –Different types of fibres and their properties: Single and multimode fibers and Step index and graded index fibers,– fibre characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses
 – Dispersion – Connectors and splicers –Fibre termination – Optical sources: Light Emitting Diode (LED), – Optical detectors: PIN Diode.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES**9**

Fibre optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fibre Optic Sensor and Displacementsensor (Extrinsic Sensor) – Fibre optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS**9**

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS**9**

Laser for measurement of distance, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS**9**

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 PERIODS**COURSE OUTCOMES (COs):**

1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
3. Understand laser theory and laser generation system.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.

TEXT BOOKS:

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
3. Eric Udd, William B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists", John Wiley & Sons, 2011.

REFERENCES:

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Ready, "Industrial Applications of Lasers", Academic Press, Digitized in 2008.

4. Monte Ross, 'Laser Applications', McGraw Hill, 1968.
5. John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
6. Keiser, G., "Optical Fiber Communication", McGraw-Hill, 3rd Edition, 2000. <http://nptel.ac.in/courses/117101002/>

20153E81A**FLEXIBLE AC TRANSMISSION SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The start-of-art of the power system
- || Performance of power systems with FACTS controllers.
- || FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION 9

Real and reactive power control in electrical power transmission lines–loads & system compensation-Uncompensated transmission line–shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–TCR-FC-TCR-Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability – Steady state power transfer –Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability-prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies- Dynamic voltage restorer(DVR).

UNIT V ADVANCED FACTS CONTROLLERS 9

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand, analyze and develop analytical model of FACTS controller for power system application.
- || Ability to understand the concepts about load compensation techniques.
- || Ability to acquire knowledge on facts devices.
- || Ability to understand the start-of-art of the power system
- || Ability to analyze the performance of steady state and transients of facts controllers.
- || Ability to study about advanced FACTS controllers.

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEE press andJohnWiley&Sons,Inc,2002.
2. NarainG. Hingorani, “Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors,Delhi-110006,2011.
3. T.J.E Miller, Power Electronics in power systems, John Wiley and sons.

REFERENCES

1. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
2. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood, HVDC and FACTS controllers—Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.

SOFT COMPUTING TECHNIQUES

20153E81B

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Basics of artificial neural network.
- | Concepts of modelling and control of neural and fuzzy control schemes.
- | Features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

UNIT III FUZZY SET THEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarization with ANFIS toolbox.

TOTAL : 45 PERIODS

OUTCOMES:

- | Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- | Ability to understand the basics of artificial neural network.
- | Ability to get knowledge on modelling and control of neural.

- | Ability to get knowledge on modelling and control of fuzzy control schemes.
- | Ability to acquire knowledge on hybrid control schemes.
- | Ability to understand the concepts of Adaptive Resonance Theory

TEXT BOOKS:

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

REFERENCES

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)”, MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, “Fuzzy Modeling and Fuzzy Control Series: Control Engineering”, 2006

20153E81C**POWER SYSTEMS DYNAMICS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Basics of dynamics and stability problems
- | Modeling of synchronous machines
- | Excitation system and speed-governing controllers.
- | Small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- | Transient stability simulation of multi machine power system.

UNIT I INTRODUCTION 9

Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING 9

Synchronous machine - flux linkage equations - Park's transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY 9

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand and analyze power system operation, stability, control and protection.
- | Ability to get knowledge on the basics of dynamics and stability problems
- | Ability to design and modelling of synchronous machines

- | Ability to study about excitation system and speed-governing controllers.
- | Ability to understand the concept of small signal stability of a single-machine infinite bus system with excitation system.
- | Ability to analyze the transient stability simulation.

TEXT BOOKS:

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.
2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.
3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCES

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. El-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition, 2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International, 2007.

20153E81D**SMPS AND UPS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Modern power electronic converters and its applications in electric power utility.
- | Resonant converters and UPS

UNIT I DC-DC CONVERTERS**9**

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II SWITCHED MODE POWER CONVERTERS**9**

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III RESONANT CONVERTERS**9**

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV DC-AC CONVERTERS**9**

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V POWER CONDITIONERS, UPS & FILTERS**9**

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to analyze the state space model for DC – DC converters
- | Ability to acquire knowledge on switched mode power converters.
- | Ability to understand the importance of Resonant Converters.
- | Ability to analyze the PWM techniques for DC-AC converters
- | Ability to acquire knowledge on modern power electronic converters and its applications in electric power utility.
- | Ability to acquire knowledge on filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

REFERENCES

1. Philip T Krein, "Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters,

- Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
 4. Erickson, Robert W, “Fundamentals of Power Electronics”, Springer, second edition, 2010.

20153E81E	ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- | To study the generation, conservation of electrical power and energy efficient equipments.
- | To understand the principle, design of illumination systems and energy efficiency lamps.
- | To study the methods of industrial heating and welding.
- | To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

20153E81F**PROFESSIONAL ETHICS IN ENGINEERING****L T P C****3 0 0 3****OBJECTIVES:**

- 1 To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES**10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS**9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION**9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES**8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS**OUTCOMES:**

- 1. Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

20153E81G**PRINCIPLES OF MANAGEMENT****L T P C
3 0 0 3****OBJECTIVES:**

- 1. To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company- public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

OUTCOMES: TOTAL: 45 PERIODS

- || Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have some basic knowledge on international aspect of management

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

20153E82A**ENERGY MANAGEMENT AND AUDITING**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | To impart concepts behind economic analysis and Load management.
- | Energy management on various electrical equipments and metering.
- | Concept of lighting systems and cogeneration.

UNIT I INTRODUCTION 9

Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targeting and reporting - Energy audit process.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION 9

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III LIGHTING SYSTEMS 9

Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS 9

Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand the basics of Energy audit process.
- | Ability to understand the basics of energy management by cogeneration
- | Ability to acquire knowledge on Energy management in lighting systems
- | Ability to impart concepts behind economic analysis and Load management.
- | Ability to understand the importance of Energy management on various electrical equipment and metering.
- | Ability to acquire knowledge on HVAC.

TEXT BOOKS:

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
5. National Productivity Council Guide Books

**20153E82B DATA STRUCTURES LTPC
3003**

OBJECTIVES:

- | To understand the concepts of ADTs
- | To Learn linear data structures – lists, stacks, and queues
- | To understand sorting, searching and hashing algorithms
- | To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to:

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008

20153E82C HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- Planning of DC power transmission and comparison with AC power transmission.
- | HVDC converters. HVDC
- | system control. Harmonics and
- | design of filters.
- | Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy– Firing angle control– Current and extinction angle control–Starting and stopping of DC link –Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis –case study

TOTAL : 45 PERIODS

OUTCOMES:

- | Ability to understand the principles and types of HVDC system.
- | Ability to analyze and understand the concepts of HVDC converters.
- | Ability to acquire knowledge on DC link control.
- | Ability to understand the concepts of reactive power management, harmonics and

power flow analysis.

- Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- Ability to understand the importance of power flow in HVDC system under steady state.

TEXT BOOKS:

1. Padiyar,K.R.,“HVDC power transmission system”, New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,“High Voltage Direct Current Transmission”, Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.,“ Power System Stability and Control”, McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG,“ High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Edward Wilson Kimbark,“ Direct Current Transmission”, Vol.I, Wiley inter science, New York, London, Sydney,1971.

20153E82D

MICROCONTROLLER BASED SYSTEM DESIGN

L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- Architecture of PIC microcontroller
- Interrupts and timers
- Peripheral devices for data communication and transfer
- Functional blocks of ARM processor
- Architecture of ARM processors

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx– Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT II INTERRUPTS AND TIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variability strings.

UNIT III PERIPHERALS AND INTERFACING 9

I²C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV INTRODUCTION TO ARM PROCESSOR 9

Architecture –ARM programmer’s model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for

Operating systems.

UNIT V ARM ORGANIZATION 9

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply computing platform and software for engineering problems.
- Ability to understand the concepts of Architecture of PIC microcontroller
- Ability to acquire knowledge on Interrupts and timers.
- Ability to understand the importance of Peripheral devices for data communication.
- Ability to understand the basics of sensor interfacing
- Ability to acquire knowledge in Architecture of ARM processors

TEXT BOOKS:

1. Peatman,J.B., “Design with PIC Micro Controllers”PearsonEducation,3rdEdition, 2004.
2. Furber,S., “ARM System on Chip Architecture” Addison Wesley trade Computer Publication, 2000.

REFERENCES

1. Mazidi, M.A.,“PIC Microcontroller” Rollin Mckinlay, Danny causey ,Prentice Hall of India, 2007.

20153E82E

SMART GRID

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- | Smart Grid technologies, different smart meters and advanced metering infrastructure.
- | The power quality management issues in Smart Grid.
- | The high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering Infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broad band over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS**OUTCOMES:**

- Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- Learners will study about different Smart Grid technologies.
- Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS:

1. Stuart Borlase "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2012.

REFERENCES

- Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol.7, No.4, November 2011.
- Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids, vol.14, 2012.
- James Momohe "Smart Grid: Fundamentals of Design and Analysis", Wiley-IEEE Press, 2012.

20153E82F**BIOMEDICAL INSTRUMENTATION****L T P C****3 0 0 3****OBJECTIVES:**

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters

- | To understand the basic principles in imaging techniques
- | To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS**OUTCOMES: At the end of the course students will have the**

- | Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- | Ability to provide latest ideas on devices of non-electrical devices.
- | Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- | Ability to understand the analysis systems of various organ types.
- | Ability to bring out the important and modern methods of imaging techniques and their analysis.
- | Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John

Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

20153E82G

FUNDAMENTALS OF NANOSCIENCE

L T P C

3 0 0 3

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS

7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobe in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

- | | Will familiarize about the science of nanomaterials
- | | Will demonstrate the preparation of nanomaterials
- | | Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

1.1.3 SUPPORTING DOCUMENTS

1.1.3 Total number of courses having focus on employability/
entrepreneurship/ skill development offered by the University during the year.

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Skill Development	
Employability	
Entrepreneurship	



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL &

ELECTRONICS ENGINEERING

COURSE STRUCTURE
M.TECH-POWER SYSTEMS
(PART TIME)

[Regulation2022]

[for candidates admitted to M.Tech Power
System program from June2022 onwards]

PRIST UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS

ENGINEERING PROGRAMME: M.TECH-POWER SYSTEMS

(PART TIME) CURRICULUM -REGULATION 2022

SEMESTER - I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22248S11DP	Applied Mathematics for Power System Engineering	3	1	0	4
2.	22272C12P	System Theory	3	1	0	4
3.	22272C13P	Advanced Power System Analysis	3	1	0	4
4.	22272L14P	Power System Simulation Laboratory	0	0	3	3
TOTAL						15

SEMESTER - II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C21P	EHV power transmission.	3	1	0	4
2	22272C22P	Advanced Power System Protection	3	1	0	4
3	22272E23_P	Elective-I	3	0	0	3
4	222TECWRP	Technical Writing/Seminars	0	0	3	3
TOTAL						14

SEMESTER - III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C31P	Economic Operations of Power Systems	3	1	0	4
2	22272C32P	HVDC and FACTS	3	1	0	4
3	22272E33_P	Elective -II	3	0	0	3

4	22272L34P	Advanced Power System Simulation Laboratory	0	0	3	3
TOTAL						14

SEMESTER - IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C41P	Power System Control	3	1	0	4
2	22272C42P	Electrical Transients in power systems	3	1	0	4
3	22272E43_P	Elective -III	3	0	0	3
4	22272P44P	Project work Phase -I	0	0	10	10
TOTAL						21

SEMESTER - V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22272E51_P	Elective -IV	3	0	0	3
2.	22272E52_P	Elective -V	3	0	0	3
3.	22272E53_P	Elective -VI	3	0	0	3
TOTAL						9

SEMESTER - VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22272P61P	Project work Phase -II	0	0	15	15

Total Credits = 88

Elective -III

Elective -I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E23AP	Analysis and Design of Power Converters	3	0	0	3
2.	22272E23BP	Modeling and Analysis of Electrical Machines	3	0	0	3
3.	22272E23CP	Advanced Power System Dynamics	3	0	0	3
4.	22272E23DP	Analysis and Computation of Electromagnetic Transients in Power Systems	3	0	0	3

Elective -II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E33AP	Smart Grid	3	0	0	3
2.	22272E33BP	Solar and Energy Storage Systems	3	0	0	3
3.	22272E33CP	Power System Reliability	3	0	0	3
4.	22272E33DP	Distributed Generation and Microgrid	3	0	0	3

Elective -III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E43AP	Wind Energy conversion systems	3	0	0	3
2.	22272E43BP	AI Techniques to Power Systems	3	0	0	3
3.	22272E43CP	Electrical Distribution System	3	0	0	3
4.	22272E43DP	Energy Management and Auditing	3	0	0	3

Elective -IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E51AP	Power Electronics applications in Power systems	3	0	0	3
2.	22272E51BP	Power system Dynamics	3	0	0	3
3.	22272E51CP	Electric Vehicles and Power Management	3	0	0	3
4.	22272E51DP	Electromagnetic Interference and Compatibility	3	0	0	3

Elective -V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22275E52AP	Power Conditioning	3	0	0	3
2.	22275E52BP	Deregulated Power System	3	0	0	3
3.	22275E52CP	Control System Design for Power Electronics	3	0	0	3
4.	22275E52DP	Principles of EHV Transmission	3	0	0	3

Elective -VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E53AP	Software for Control system Design	3	0	0	3
2.	22272E53BP	Industrial Power system analysis and design	3	0	0	3
3.	22272E53CP	Soft Computing Techniques	3	0	0	3
4.	22272E53DP	Restructured Power System	3	0	0	3

Credit Distribution

Sem.	Core Courses				Elective Courses		Total Credits
	Theory Courses		Practical Courses		Nos.	Credits	
	Nos.	Credits	Nos.	Credits			
I	02	08	01	03	-	-	15
II	02	08	01	03	01	03	14
III	02	08	01	03	01	03	14
IV	02	08	01	10	01	03	21
V	-	-	-	-	03	09	09
VI	-	-	01	15	-	-	15
Total Credits							88

1. ADVANCED MATRIX THEORY**9**

Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.

2. RANDOM PROCESSES**9**

Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .

3. LINEAR PROGRAMMING**9**

Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.

4. DYNAMIC PROGRAMMING**9**

Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS**9**

Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of $J_n(p) = 0$, Transform of

$$\frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx}, \text{ and Transform of } \frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx} - \frac{n^2f}{x^2}$$

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).
5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

22272C12P - SYSTEM THEORY

3 1 0 4

1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT 9

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS 9

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS 9

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS 9

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY 9

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

22272C13P - ADVANCED POWER SYSTEM ANALYSIS**3 1 0 4****OBJECTIVES:**

- To introduce different techniques of dealing with sparse matrix for large scale power systems.
- To impart in-depth knowledge on different methods of power flow solutions.
- To perform optimal power flow solutions in detail.
- To perform short circuit fault analysis and understand the consequence of different type of faults.
- To Illustrate different numeric al integration methods and factors influencing transient stability

UNIT I SOLUTION TECHNIQUE 9

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays –Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

UNIT II POWER FLOW ANALYSIS 9

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment..

UNIT III OPTIMAL POWER FLOW 9

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

UNIT IV SHORT CIRCUIT ANALYSIS 9

Formation of bus impedance matrix with mutual coupling (single phase basis and three phase basis)- Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase – symmetrical and unsymmetrical faults.

UNIT V TRANSIENT STABILITY ANALYSIS 9

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

OUTCOMES:

- Ability to apply the concepts of sparse matrix for large scale power system analysis
- Ability to analyze power system studies that needed for the transmission system planning.

REFERENCES:

1. A.J.Wood and B.F.Wollenberg, “Power Generation Operation and Control”, John Wiley and sons, New York, 1996.
2. W.F.Tinney and W.S.Meyer, “Solution of Large Sparse System by Ordered Triangular Factorization” IEEE Trans. on Automatic Control, Vol : AC-18, pp:333346 Aug 1973.
- 3.K.Zollenkopf, “Bi-Factorization: Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on “Large Sparse Set of Linear Systems” Editor: J.K.Rerd,Academic Press, 1971.
4. M.A.Pai,” Computer Techniques in Power System Analysis”,Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.
5. G W Stagg , A.H El. Abiad, “Computer Methods in Power System Analysis”, McGraw Hill, 1968.
6. P.Kundur, “Power System Stability and Control”, McGraw Hill, 1994.

OBJECTIVES:

- To have hands on experience on various system studies and different techniques used
- for system planning using Software packages
- To perform the dynamic analysis of power system
-

LIST OF EXPERIMENTS

1. Power flow analysis by Newton-Raphson method and Fast decoupled method
2. Transient stability analysis of single machine-infinite bus system using classical machine model
3. Contingency analysis: Generator shift factors and line outage distribution factors
4. Economic dispatch using lambda-iteration method
5. Unit commitment: Priority-list schemes and dynamic programming
6. State Estimation (DC)
7. Analysis of switching surge using EMTP: Energisation of a long distributed- parameter line
8. Analysis of switching surge using EMTP : Computation of transient recovery voltage
9. Simulation and Implementation of Voltage Source Inverter
10. Digital Over Current Relay Setting and Relay Coordination using Suitable software packages
- 11 Co-ordination of over-current and distance relays for radial line protection

TOTAL: 60 PERIODS**OUTCOMES:**

- Upon Completion of the course, the students will be able to:
- Analyze the power flow using Newton-Raphson method and Fast decoupled method.
- Perform contingency analysis & economic dispatch
- Set Digital Over Current Relay and Coordinate Relay

1. INTRODUCTION**9**

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS**9**

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS**9**

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS**9**

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES**9**

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer's Handbook, Revised and Enlarged 6th Edition, TNEB Engineers' Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

OBJECTIVES:

- To illustrate concepts of transformer protection
- To describe about the various schemes of Over current protection
- To analyze distance and carrier protection
- To familiarize the concepts of Generator protection and Numerical protection

UNIT I OVER CURRENT & EARTH FAULT PROTECTION 9

Zones of protection – Primary and Backup protection – operating principles and Relay Construction - Time – Current characteristics-Current setting – Time setting-Over current protective schemes –Concept of Coordination - Protection of parallel / ring feeders – Reverse power or directional relay –Polarisation Techniques – Cross Polarisation – Quadrature Connection -Earth fault and phase fault protection - Combined Earth fault and phase fault protection scheme - Phase fault protective - scheme directional earth fault relay - Static over current relays – Numerical over – current protection; numerical coordination example for a radial feeder

UNIT II TRANSFORMER & BUSBAR PROTECTION 9

Types of transformers –Types of faults in transformers- Types of Differential Protection – High Impedance – External fault with one CT saturation – Actual behaviors of a protective CT – Circuit model of a saturated CT - Need for high impedance – Disadvantages - Percentage Differential Bias Characteristics – Vector group & its impact on differential protection - Inrush phenomenon – Zero Sequence filtering – High resistance Ground Faults in Transformers – Restricted Earth fault Protection - Inter-turn faults in transformers – Incipient faults in transformers - Phenomenon of overfluxing in transformers – Transformer protection application chart. Differential protection of busbars external and internal fault - Supervisory relay-protection of three – Phase busbars – Numerical examples on design of high impedance busbar differential scheme –Biased Differential Characteristics – Comparison between Transformer differential & Busbar differential.

UNIT III DISTANCE AND CARRIER PROTECTION OF TRANSMISSION LINES**9**

Drawback of over – Current protection – Introduction to distance relay – Simple impedance relay – Reactance relay – mho relays comparison of distance relay – Distance protection of a three – Phase line-reasons for inaccuracy of distance relay reach - Three stepped distance protection Trip contact configuration for the three - Stepped distance protection - Three-stepped protection f three-phase line against all ten shunt faults - Impedance seen from relay side - Three-stepped protection of double end fed lines-need for carrier – Aided protection – Various options for a carrier –Coupling and trapping the carrier into the desired line section - Unit type carrier aided

directional comparison relaying – Carrier aided distance schemes for acceleration of zone II; numerical example for a typical distance protection scheme for a transmission line.

UNIT IV GENERATOR PROTECTION

9

Electrical circuit of the generator – Various faults and abnormal operating conditions – Stator Winding Faults – Protection against Stator (earth) faults – third harmonic voltage protection – Rotor fault – Abnormal operating conditions - Protection against Rotor faults – Potentiometer Method – injection method – Pole slipping – Loss of excitation – Protection against Mechanical faults; Numerical examples for typical generator protection schemes

UNIT V NUMERICAL PROTECTION

Introduction–Block diagram of numerical relay - Sampling theorem- Correlation with a reference (LES) technique-Digital filtering-numerical over - Current protection– Numerical transformer differential protection-Numerical distance protection of transmission line

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- Learners will have knowledge on Overcurrent protection.
- Learners will attain knowledge about Distance and Carrier protection in transmission lines.
- Learners will understand the concepts of Generator protection.
- Learners will attain basic knowledge on substation automation.

REFERENCES

- 1 Y.G. Paithankar and S.R Bhide, “Fundamentals of Power System Protection”, Prentice-Hall of India, 2003
- 2 Badri Ram and D.N. Vishwakarma, “Power System Protection and Switchgear”, Tata McGraw- Hill Publishing Company, 2002.
- 3 T.S.M. Rao, “Digital Relay / Numerical relays”, Tata McGraw Hill, New Delhi, 1989.
- 4 P.Kundur, “Power System Stability and Control”, McGraw-Hill, 1993.

22272C31P - ECONOMIC OPERATIONS OF POWER SYSTEMS**3 1 0 4****1. INTRODUCTION 9**

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM 9

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal sitting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT 9

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, "Economic control of Interconnected systems", Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

22272C32P - HVDC and FACTS**3 1 0 4****OBJECTIVES:**

- To emphasize the need for FACTS controllers.
- To learn the characteristics, applications and modeling of series and controllers.
- To analyze the interaction of different FACTS controller and coordination
- To impart knowledge on operation, modelling and control of HVDC link.
- To perform steady state analysis of AC/DC system.

UNIT I INTRODUCTION 9

Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation: Effect of series and shunt compensation at the mid-point of the line on power transfer- Need for FACTS controllers- types of FACTS controllers. Comparison of AC & DC Transmission, Applications of DC Transmission Topologies.

UNIT II SVC & STATCOM 9

Configuration of SVC- voltage regulation by SVC- Modelling of SVC for load flow analysis Design of SVC to regulate the mid-point voltage of a SMIB system- Applications Static synchronous compensator (STATCOM)- Operation of STATCOM – Voltage regulation – Power flow control with STATCOM.

UNIT III TCSC and SSSC 9

Concepts of Controlled Series Compensation- Operation of TCSC - Analysis of TCSC operation - Modelling of TCSC for load flow studies - Static synchronous series compensator (SSSC)- Operation of SSSC - Modelling of SSSC for power flow – operation of Unified power flow controllers(UPFC).

UNIT IV ANALYSIS OF HVDC LINK 9

Simplified analysis of six pulse Graetz bridge – Characteristics - Analysis of converter operations – Commutation overlap – Equivalence circuit of bipolar DC transmission link – Modes of operation – Mode ambiguity – Different firing angle controllers – Power flow control.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC Quantities - Modelling of DC links - Solution of DC load flow - Solution of AC-DC power flow – Unified and Sequential methods.

TOTAL : 45 PERIODS**OUTCOMES:**

- Learners will be able to refresh on basics of power transmission networks and need for FACTS controllers
- Learners will understand the significance about different voltage source converter based FACTS controllers
- Learners will understand the significance of HVDC converters and HVDC system control
- Learners will attain knowledge on AC/DC power flow analysis

REFERENCES

1. Mohan Mathur, R., Rajiv. K. Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.
2. K.R.Padiyar, “FACTS Controllers in Power Transmission and Distribution”, New Age International (P) Ltd., Publishers, New Delhi, Reprint 2008.
3. K.R.Padiyar, “HVDC Power Transmission Systems”, New Age International (P) Ltd., New Delhi, 2002.
4. J.Arrillaga, “High Voltage Direct Current Transmission”, Peter Pregrinus, London, 1983.
5. V.K.Sood, “HVDC and FACTS controllers- Applications of Static Converters in Power System”, Kluwer Academic Publishers 2004

22272L34P- ADVANCED POWER SYSTEM SIMULATION**LABORATORY****LT P C****0 0 4 2****OBJECTIVES:**

- To analyze the effect of FACTS controllers by performing steady state analysis.
- To have hands on experience on different wind energy conversion technologies

LIST OF EXPERIMENTS

1. Small-signal stability analysis of single machine-infinite bus system using classical machine model
2. Small-signal stability analysis of multi-machine configuration with classical machine model
3. Induction motor starting analysis
4. Load flow analysis of two-bus system with STATCOM
5. Transient analysis of two-bus system with STATCOM
6. Available Transfer Capability calculation using an existing load flow program
7. Study of variable speed wind energy conversion system- DFIG
8. Study of variable speed wind energy conversion system- PMSG
9. Computation of harmonic indices generated by a rectifier feeding a R-L load
10. Design of active filter for mitigating harmonics

SEMESTER – IV**22272C41P - POWER SYSTEM CONTROL****3 1 0 4****1. AUTOMATIC GENERATION CONTROL****9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman’s method.

2. AUTOMATIC VOLTAGE CONTROL**9**

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT**9**

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION**9**

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system-computation consideration – external equivalency. Treatment of bad data and on line load flow

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C = 4

REFERENCES

1. Kundur.P., “power system stability and control”, McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A, “power system control and stability”, Galgotia publication, New Delhi, 1981.
3. Taylor C.W., “power systems voltage stability”, McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., “power system stability”, Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, “voltage stability of power system”, Kluwer Academic Publishers, 1998.
7. Elgerd O.L., “Electric energy systems theory – an introduction”, McGraw Hill, New Delhi, 1971.

1. TRAVELLING WAVES ON TRANSMISSION LINE 9

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level – overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C = 4

REFERENCES

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

**22272E23AP – ANALYSIS AND DESIGN OF POWER CONVERTERS L T P C
3 0 0 3**

OBJECTIVES:

- To determine the operation and characteristics of controlled rectifiers.
- To apply switching techniques and basic topologies of DC-DC switching regulators.
- To introduce the design of power converter components.
- To provide an in depth knowledge about resonant converters.
- To comprehend the concepts of AC-AC power converters and their applications.

UNIT I	SINGLE PHASE & THREE PHASE CONVERTERS	9
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Principle of phase controlled converter operation – single-phase full converter and semi-converter (RL,RLE load)- single phase dual converter – Three phase operation full converter and semi-converter (R,RL,RLE load) – reactive power – power factor improvement techniques – PWM rectifiers.

UNIT II	DC-DC CONVERTERS	9
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Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk& SEPIC – under continuous and discontinuous operation – Isolated converters: basic operation of Flyback, Forward and Push-pull topologies.

UNIT III	DESIGN OF POWER CONVERTER COMPONENTS	9
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Introduction to magnetic materials- hard and soft magnetic materials –types of cores , copper windings – Design of transformer –Inductor design equations –Examples of inductor design for buck/flyback converter-selection of output filter capacitors – selection of ratings for devices – input filter design.

UNIT IV	RESONANT DC-DC CONVERTERS	9
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Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters- load resonant converters – series and parallel – resonant switch converters – operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS-Introduction to ZVT/ZCT PWM converters.

UNIT V	AC-AC CONVERTERS	9
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Principle of on-off and phase angle control – single phase ac voltage controller – analysis with R & RL load – Three phase ac voltage controller – principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to:

- Analyze various single phase and three phase power converters
- Select and design dc-dc converter topologies for a broad range of power conversion

- applications.
- Develop improved power converters for any stringent application requirements.
 - Design ac-ac converters for variable frequency applications.

TEXT BOOKS:

- 1 Ned Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: converters, Application and design" John Wiley and sons. Wiley India edition, 2006.
- 2 Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.
- 3 P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.
- 4 P.S. Bimbhra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003
- 5 Simon Ang, Alejandro Oliva, "Power-Switching Converters, Second Edition, CRC Press, Taylor & Francis Group, 2010
- 6 V. Ramanarayanan, "Course material on Switched mode power conversion", 2007
- 7 Alex Van den Bossche and Vencislav Cekov Valchev, "Inductors and Transformers for Power Electronics", CRC Press, Taylor & Francis Group, 2005
- 8 W. G. Hurley and W. H. Wolfle, "Transformers and Inductors for Power Electronics Theory, Design and Applications", 2013 John Wiley & Sons Ltd.
- 9 Marian. K. Kazimierczuk and Dariusz Czarkowski, "Resonant Power Converters", John Wiley & Sons limited, 2011

22272E23BP - MODELING AND ANALYSIS OF ELECTRICAL MACHINES**3 1 0 4****UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION**

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

- To perform transient stability analysis using unified algorithm.
- To impart knowledge on sub-synchronous resonance and oscillations
- To analyze voltage stability problem in power system.
- To familiarize the methods of transient stability enhancement

UNIT I TRANSIENT STABILITY ANALYSIS

9

Review of numerical integration methods: Euler and Fourth Order Runge-Kutta methods, Numerical stability and implicit methods, Interfacing of Synchronous machine (variable voltage) model to the transient stability algorithm (TSA) with partitioned – explicit and implicit approaches – Interfacing SVC with TSA-methods to enhance transient stability

UNIT II UNIFIED ALGORITHM FOR DYNAMIC ANALYSIS OF POWER SYSTEMS

9

Need for unified algorithm- numerical integration algorithmic steps-truncation error-variable step size – handling the discontinuities- numerical stability- application of the algorithm for transient. Mid-term and long-term stability simulations

UNIT III SUBSYNCHRONOUS RESONANCE (SSR) AND OSCILLATIONS

9

Subsynchronous Resonance (SSR) – Types of SSR - Characteristics of series –Compensated transmission systems –Modeling of turbine-generator-transmission network- Self-excitation due to induction generator effect – Torsional interaction resulting in SSR – Methods of analyzing SSR – Numerical examples illustrating instability of subsynchronous oscillations – time-domain simulation of subsynchronous resonance – EMTP with detailed synchronous machine model- Turbine Generator Torsional Characteristics: Shaft system model – Examples of torsional characteristics – Torsional Interaction with Power System Controls: Interaction with generator excitation controls – Interaction with speed governors – Interaction with nearby DC converters

UNIT IV TRANSMISSION, GENERATION AND LOAD ASPECTS OF VOLTAGE STABILITY ANALYSIS

9

Review of transmission aspects – Generation Aspects: Review of synchronous machine theory – Voltage and frequency controllers – Limiting devices affecting voltage stability – Voltage-reactive power characteristics of synchronous generators – Capability curves – Effect of machine limitation on deliverable power – Load Aspects – Voltage dependence of loads – Load restoration dynamics – Induction motors – Load tap changers – Thermostatic load recovery – General aggregate load models.

UNIT V ENHANCEMENT OF TRANSIENT STABILITY AND COUNTER MEASURES FOR SUB SYNCHRONOUS RESONANCE

9

Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving, high-speed excitation systems; NGH damper scheme.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- Learners will have knowledge on Over current protection.
- Learners will attain knowledge about Distance and Carrier protection in transmission lines.
- Learners will understand the concepts of Busbar protection.
- Learners will attain basic knowledge on numerical protection techniques

REFERENCES

- 1 R.Ramnujam," Power System Dynamics Analysis and Simulation", PHI Learning Private Limited, New Delhi, 2009
- 2 T.V. Cutsem and C.Vournas, "Voltage Stability of Electric Power Systems", Kluwer publishers,1998
- 3 P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
- 4 H.W. Dommel and N.Sato, "Fast Transient Stability Solutions," IEEE Trans., Vol. PAS-91, pp, 1643-1650, July/August 1972.
- 5 Roderick J . Frowd and J. C. Giri, "Transient stability and Long term dynamics unified", IEEE Trans., Vol 101, No. 10, October 1982.
- 6 M.Stubbe, A.Bihain,J.Deuse, J.C.Baader, "A New Unified software program for the study of the dynamic behaviour of electrical power system" IEEE Transaction, Power Systems, Vol.4.No.1,Feb:1989 Pg.129 to 138

OBJECTIVES:

- To understand the various types of transients and its analysis in power system.
- To learn about modeling and computational aspects transients computation

UNIT I REVIEW OF TRAVELLING WAVE PHENOMENA 9

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behaviour of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion.

UNIT II LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning overvoltages: interaction between lightning and power system- ground wire voltage and voltage across insulator; switching overvoltage: Short line or kilometric fault, energizing transients - closing and re-closing of lines, methods of control; temporary overvoltages: line dropping, load rejection; voltage induced by fault; very fast transient overvoltage (VFTO).

UNIT III PARAMETERS AND MODELING OF OVERHEAD LINES 9

Review of line parameters for simple configurations: series resistance, inductance and shunt capacitance; bundle conductors : equivalent GMR and equivalent radius; modal propagation in transmission lines: modes on multi-phase transposed transmission lines, α - β -0 transformation and symmetrical components transformation, modal impedances; analysis of modes on untransposed lines; effect of ground return and skin effect; transposition schemes;

UNIT V FAST TRANSIENTS PHENOMENON IN AIS AND GIS 9

Digital computation of line parameters: why line parameter evaluation programs? Salient features of a typical line parameter evaluation program; constructional features of that affect transmission line parameters; line parameters for physical and equivalent phase conductors elimination of ground wires bundling of conductors; principle of digital computation of transients: features and capabilities of electromagnetic transients program; steady state and time step solution modules: basic solution methods; case studies on simulation of various types of transients

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will be able to model over head lines, cables and transformers.
- Learners will be able to analyze power system transients.

REFERENCES

1 Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.

2 R. Ramanujam, “Computational Electromagnetic Transients: Modeling, Solution Methods and Simulation”, I.K. International Publishing House Pvt. Ltd, New Delhi, 2014.

3 Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.

22272E33AP

SMART GRID

LTPC

3003

OBJECTIVES:

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID**9**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES**9**

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE**9**

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID**9**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS**9**

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- Learners will study about different Smart Grid technologies.
- Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid application

REFERENCES

- 1 Stuart Borlase “Smart Grid :Infrastructure, Technology and Solutions”, CRC Press 2012.
- 2 Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley 2012.
- 3 Vehbi C. Güngör, DilanSahin, TaskinKocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication Technologies and Standards” IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.
- 4 Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids, vol. 14, j2012.

OBJECTIVES:

- To Study about solar modules and PV system design and their applications
- To Deal with grid connected PV systems
- To Discuss about different energy storage systems

UNIT I INTRODUCTION**9**

Characteristics of sunlight – semiconductors and P-N junctions –behavior of solar cells – cell properties – PV cell interconnection

UNIT II STAND ALONE PV SYSTEM**9**

Solar modules – storage systems – power conditioning and regulation - MPPT- protection – stand alone PV systems design – sizing

UNIT III GRID CONNECTED PV SYSTEMS**9**

PV systems in buildings – design issues for central power stations – safety – Economic aspect – Efficiency and performance - International PV programs

UNIT IV ENERGY STORAGE SYSTEMS**9**

Impact of intermittent generation – Battery energy storage – solar thermal energy storage – pumped hydroelectric energy storage

UNIT V APPLICATIONS**9**

Water pumping – battery chargers – solar car – direct-drive applications –Space – Telecommunications.

TOTAL : 45 PERIODS**OUTCOMES:**

- Students will develop more understanding on solar energy storage systems
- Students will develop basic knowledge on standalone PV system
- Students will understand the issues in grid connected PV systems
- Students will study about the modeling of different energy storage systems and their performances
- Students will attain more on different applications of solar energy

REFERENCES

- 1 Solanki C.S., "Solar Photovoltaics: Fundamentals, Technologies And Applications", PHI Learning Pvt. Ltd.,2015.

- 2 Stuart R.Wenham, Martin A.Green, Muriel E. Watt and Richard Corkish, "Applied Photovoltaics", 2007,Earthscan, UK. Eduardo Lorenzo G. Araujo, "Solar electricity engineering of photovoltaic systems", Progensa,1994.
- 3 Frank S. Barnes & Jonah G. Levine, "Large Energy storage Systems Handbook", CRC Press, 2011.
- 4 McNeils, Frenkel, Desai, "Solar & Wind Energy Technologies", Wiley Eastern, 1990
- 5 S.P. Sukhatme , "Solar Energy", Tata McGraw Hill,1987.

OBJECTIVES:

3 0 0 3

- To introduces the objectives of Load forecasting.
- To study the fundamentals of Generation system, transmission system and Distribution system reliability analysis
- To illustrate the basic concepts of Expansion planning

UNIT I LOAD FORECASTING 9

Objectives of forecasting - Load growth patterns and their importance in planning - Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

UNIT II GENERATION SYSTEM RELIABILITY ANALYSIS 9

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of ISO and interconnected generation systems

UNIT III TRANSMISSION SYSTEM RELIABILITY ANALYSIS 9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served

UNIT IV EXPANSION PLANNING 9

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

UNIT V DISTRIBUTION SYSTEM PLANNING OVERVIEW 9

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students will develop the ability to learn about load forecasting.
- Students will learn about reliability analysis of ISO and interconnected systems.
- Students will understand the concepts of Contingency analysis and Probabilistic Load flow Analysis
- Students will be able to understand the concepts of Expansion planning

- Students will have knowledge on the fundamental concepts of the Distribution system planning

REFERENCES

- 1 Roy Billinton & Ronald N. Allan, "Reliability Evaluation of Power Systems" Springer Publication,
- 2 R.L. Sullivan, "Power System Planning", Tata McGraw Hill Publishing Company Ltd 1977.
- 3 X. Wang & J.R. McDonald, "Modern Power System Planning", McGraw Hill Book Company 1994.
- 4 T. Gonen, "Electrical Power Distribution Engineering", McGraw Hill Book Company 1986.
- 5 B.R. Gupta, "Generation of Electrical Energy", S.Chand Publications 1983.

OBJECTIVES:

- To illustrate the concept of distributed generation
- To analyze the impact of grid integration.
- To study concept of Microgrid and its configuration

UNIT I	INTRODUCTION	9
Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.		
UNIT II	DISTRIBUTED GENERATIONS (DG)	9
Concept of distributed generations, topologies, selection of sources, regulatory standards/framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants		
UNIT III	IMPACT OF GRID INTEGRATION	9
Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.		
UNIT IV	BASICS OF A MICROGRID	9
Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids		
UNIT V	CONTROL AND OPERATION OF MICROGRID	9
Modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.		

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will attain knowledge on the various schemes of conventional and nonconventional power generation.

- Learners will have knowledge on the topologies and energy sources of distributed generation.
- Learners will learn about the requirements for grid interconnection and its impact with NCE sources
- Learners will understand the fundamental concept of Microgrid.

REFERENCES

- 1 Amirnaser Yezdani, and Reza Iravani, “Voltage Source Converters in Power Systems: Modeling, Control and Applications”, IEEE John Wiley Publications, 2010.
- 2 Dorin Neacsu, “Power Switching Converters: Medium and High Power”, CRC Press, Taylor & Francis, 2006
- 3 Chetan Singh Solanki, “Solar Photo Voltaics”, PHI learning Pvt. Ltd., New Delhi, 2009
- 4 J.F. Manwell, J.G. McGowan “Wind Energy Explained, theory design and applications”, Wiley publication 2010.
- 5 D. D. Hall and R. P. Grover, “Biomass Regenerable Energy”, John Wiley, New York, 1987.
- 6 John Twidell and Tony Weir, “Renewable Energy Resources” Taylor and Francis Publications, Second edition 2006.

22272E43AP - WIND ENERGY CONVERSION SYSTEMS**3 1 0 4****UNIT-I INTRODUCTION:****9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER**GENERATION:****9**

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS:**9**

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments- anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND**CONTROL ASPECTS:****9**

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanent magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY**9**

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power from the wind", Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

22272E43BP - AI TECHNIQUES TO POWER SYSTEMS**3 1 0 4****1. INTRODUCTION TO NEURAL NETWORKS****9**

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS**9**

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC**9**

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS**9**

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS**9**

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C = 4**REFERENCES:**

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques”, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, 1993.
3. Zimmerman.H.J,„Fuzzy Set Theory and its Applications”, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems”, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering”, John Wiley & SonsLtd.,1998.

OBJECTIVES:**3 0 0 3**

- To provide knowledge about the distribution system electrical characteristics
- To gain knowledge about planning and designing of distribution system
- To analyze power quality in distribution system
- To analyze the power flow in balanced and unbalanced system

UNIT I	INTRODUCTION	9
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Distribution System-Distribution Feeder Electrical Characteristics-Nature of Loads : Individual Customer Load, Distribution Transformer Loading and Feeder Load -Approximate Method of Analysis: Voltage Drop, Line Impedance, "K" Factors, Uniformly Distributed Loads and Lumping Loads in Geometric Configurations.

UNIT II	DISTRIBUTION SYSTEM PLANNING	9
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Factors effecting planning, present techniques, planning models(Short term planning, long term planning and dynamic planning), planning in the future, future nature of distribution planning, Role of computer in Distribution planning. Load forecast, Load characteristics and Load models.

UNIT III	DISTRIBUTION SYSTEM LINE MODEL	9
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Exact Line Segment Model-Modified Line Model- Approximate Line Segment Model-Modified "Ladder" Iterative Technique-General Matrices for Parallel Lines.

UNIT IV	VOLTAGE REGULATION	9
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Standard Voltage Ratings-Two-Winding Transformer Theory-Two-Winding Autotransformer-Step-Voltage Regulators: Single-Phase Step-Voltage Regulators-Three-Phase Step-Voltage Regulators- Application of capacitors in Distribution system.

UNIT V	DISTRIBUTION FEEDER ANALYSIS	9
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Power-Flow Analysis- Ladder Iterative Technique -Unbalanced Three-Phase Distribution Feeder- Modified Ladder Iterative Technique- Load Allocation- Short-Circuit Studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- Ability to apply the concepts of planning and design of distribution system for utility systems
- Ability to implement the concepts of voltage control in distribution system.
- Ability to analyze the power flow in balanced and unbalanced system

REFERENCES

1. William H. Kersting, " Distribution System Modeling and Analysis " CRC press 3rd edition,2012.
2. Turan Gonen, "Electric Power Distribution System Engineering", McGraw Hill Company. 1986
3. James Northcote – Green, Robert Wilson, "Control and Automation of Electrical Power Distribution Systems", CRC Press, New York, 2007.
4. Pabla H S, "Electrical Power Distribution Systems", Tata McGraw Hill. 2004

OBJECTIVES: 3 0 0 3

- To study the concepts behind economic analysis and Load management.
- To emphasize the energy management on various electrical equipments and metering.
- To illustrate the concept of lighting systems and cogeneration.

UNIT I INTRODUCTION 9

Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNIT II ENERGY COST AND LOAD MANAGEMENT 9

Important concepts in an economic analysis - Economic models-Time value of money-Utility rate structures- cost of electricity-Loss evaluation- Load management: Demand control techniques-Utility monitoring and control system-HVAC and energy management-Economic justification.

UNIT III ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT 9

Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples.

UNIT V LIGHTING SYSTEMS & COGENERATION 9

Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TOTAL : 45 PERIODS

OUTCOMES:

- Students will develop the ability to learn about the need for energy management and auditing process

Skill Development

Employability

Entrepreneurship

22272E43DP- ENERGY MANAGEMENT AND AUDITING L T P C

- Learners will learn about basic concepts of economic analysis and load management.
- Students will understand the energy management on various electrical equipments.
- Students will have knowledge on the concepts of metering and factors influencing cost function

- Students will be able to learn about the concept of lighting systems, light sources and various forms of cogeneration

REFERENCES

- 1 Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, "Guide to Energy Management", Fifth Edition, The Fairmont Press, Inc., 2006
- 2 Eastop T.D & Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, 1990.
- 3 Reay D.A, "Industrial Energy Conservation", 1st edition, Pergamon Press, 1977.
- 4 "IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities", IEEE, 1996
- 5 Amit K. Tyagi, "Handbook on Energy Audits and Management", TERI, 2003.

22272E51AP- POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS LTPC**3 1 0 4****UNIT: I STATIC COMPENSATOR CONTROL****9**

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) -Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT**9**

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS**9**

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL**9**

Solid state excitation of synchronous generators - Different schemes - Generex excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM**9**

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C =4**TEXT BOOK**

Miller. T.J.E, "Reactive power control in Electric systems". Wiley inter science, New York, 1982.

REFERENCES

1. "Static Compensator for AC power systems", Proc. IEE vol.128 Nov. 1981. pp 362-406.
2. "A Static alternative to the transformer on load tap changing", IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "Improvements in Thyristor controlled static on- load tap controllers for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Generex Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

22272E32B- POWER SYSTEM DYNAMICS**3 1 0 4****1. SYNCHRONOUS MACHINE MODELLING 9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS,

analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY

9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

OBJECTIVES:

- To understand the concept of electrical vehicles and its operations
- To understand the need for energy storage in hybrid vehicles
- To provide knowledge about various possible energy storage technologies that can be used in electric vehicles

UNIT I ELECTRIC VEHICLES AND VEHICLE MECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics

UNIT II ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS 9

Architecture of EV's and HEV's - Plug-n Hybrid Electric Vehicles (PHEV)- Power train components and sizing, Gears, Clutches, Transmission and Brakes

UNIT III CONTROL OF DC AND AC DRIVES 9

DC/DC chopper based four quadrant operations of DC drives - Inverter based V/f Operation (motoring and braking) of induction motor drive system - Induction motor and permanent motor based vector control operation - Switched reluctance motor (SRM) drives

UNIT IV BATTERY ENERGY STORAGE SYSTEM 9

Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries

UNIT V ALTERNATIVE ENERGY STORAGE SYSTEMS 9

Fuel cell - Characteristics- Types - hydrogen Storage Systems and Fuel cell EV - Ultra capacitors

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will understand the operation of Electric vehicles and various energy storage technologies for electrical vehicles

REFERENCES

- 1 Iqbal Hussain, “**Electric and Hybrid Vehicles: Design Fundamentals, Second Edition**” CRC Press, Taylor & Francis Group, Second Edition (2011).
- 2 Ali Emadi, Mehrdad Ehsani, John M.Miller, “Vehicular Electric Power Systems”, Special Indian Edition, Marcel dekker, Inc 2010.

OBJECTIVES:

- To provide fundamental knowledge on electromagnetic interference and electromagnetic compatibility.
- To study the important techniques to control EMI and EMC.
- To expose the knowledge on testing techniques as per Indian and international standards in EMI measurement.

UNIT I INTRODUCTION 9

Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation typical noise path- EMI predictions and modeling, Cross talk - Methods of eliminating interferences.

UNIT II GROUNDING AND CABLING 9

Cabling- types of cables, mechanism of EMI emission / coupling in cables -capacitive coupling inductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding - safety grounds - signal grounds- single point and multipoint ground systems hybrid grounds- functional ground layout -grounding of cable shields- -guard shields- isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding- Earth measurement Methods

UNIT III BALANCING, FILTERING AND SHIELDING 9

Power supply decoupling- decoupling filters-amplifier filtering -high frequency filtering- EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding - near and far field shielding effectiveness - absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings - grounding of shields

UNIT IV EMI IN ELEMENTS AND CIRCUITS 9

Electromagnetic emissions, noise from relays and switches, non- linearities in circuits, passive inter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

UNIT V ELECTROSTATIC DISCHARGE, STANDARDS AND TESTING TECHNIQUES 9

Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipments- standards - FCC requirements - EMI measurements - Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

TOTAL: 45 PERIODS**OUTCOMES:**

- Recognize the sources of Conducted and radiated EMI in Power Electronic Converters and consumer appliances and suggest remedial measures to mitigate the problems
- Assess the insertion loss and design EMI filters to reduce the loss
- Design EMI filters, common-mode chokes and RC-snubber circuits measures to keep the interference within tolerable limits

REFERENCES

1. V.P. Kodali, "Engineering Electromagnetic Compatibility", S. Chand, 1996
2. Henry W.Ott, " Noise reduction techniques in electronic systems", John Wiley & Sons, 1989
3. Bernhard Keiser, "Principles of Electro-magnetic Compatibility", Artech House, Inc. (685 canton street, Norwood, MA 020062 USA) 1987
4. Bridges, J.E Milleta J. and Ricketts.L.W., "EMP Radiation and Protective techniques", John Wiley and sons, USA 1976
5. William Duff G., & Donald White R. J, "Series on Electromagnetic Interference and Compatibility", Vol.
6. Weston David A., "Electromagnetic Compatibility, Principles and Applications", 1991.

22275E52AP - POWER CONDITIONING**3 1 0 4****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters –Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC – control strategies: P- Q theory, Synchronous detection method – Custom power park – Status of application of custom power devices

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)
3. Dugan.R.C, “Electrical Power System Quality”,TMH,2008.
- 4.Arrillga.A.J and Neville R.Watson, Power System Harmonics, John Wiley second Edition,2003.
5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.

ELECTIVES – V (semester-III)**22275E52BP – DEREGULATED POWER SYSTEM****3 1 0 4****1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9**

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, “Restructuring Electrical Power Systems”, Marcel Decker Inc., 2001.
4. Steven Stoft, “ Power System Economics”, Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

22275E52CP

**CONTROL SYSTEM DESIGN FOR POWER
ELECTRONICS****L T P C
3 0 0 3****OBJECTIVES:**

- To explore conceptual bridges between the fields of Control Systems and Power Electronics
- To Study Control theories and techniques relevant to the design of feedback controllers in Power Electronics.

UNIT I MODELLING OF DC-TO-DC POWER CONVERTERS**9**

Modelling of Buck Converter , Boost Converter ,Buck- Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter General Mathematical Model for Power Electronics Devices.

UNIT II SLIDING MODE CONTROLLER DESIGN**9**

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces, Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter.

UNIT III APPROXIMATE LINEARIZATION CONTROLLER DESIGN**9**

Linear Feedback Control, Pole Placement by Full State Feedback , Pole Placement Based on Observer Design ,Reduced Order Observers , Generalized Proportional Integral Controllers, Passivity Based Control , Sliding Mode Control Implementation of Buck Converter , Boost Converter ,Buck-Boost Converter.

UNIT IV NONLINEAR CONTROLLER DESIGN**9**

Feedback Linearization Isidori's Canonical Form, Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced Order Observers.

UNIT V PREDICTIVE CONTROL OF POWER CONVERTERS**9**

Basic Concepts, Theory, and Methods, Application of Predictive Control in Power Electronics, AC-DC-AC Converter System, Faults and Diagnosis Systems in Power Converters.

TOTAL:45 PERIODS**OUTCOMES:**

- Ability to understand an overview on modern linear and nonlinear control strategies for power electronics devices
- Ability to model modern power electronic converters for industrial applications
- Ability to design appropriate controllers for modern power electronics devices.

REFERENCES

1. Hebertt Sira-Ramírez, Ramón Silva-Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer 2012
2. Mahesh Patil, Pankaj Rodey, "Control Systems for Power Electronics: A Practical Guide", Springer India, 2015.

3. Blaabjerg José Rodríguez, “Advanced and Intelligent Control in Power Electronics and Drives” , Springer, 2014
4. Enrique Acha, Vassilios Agelidis, Olimpo Anaya, TJE Miller, “Power Electronic Control in Electrical Systems”, Newnes, 2002
5. Marija D. Aranya Chakraborty, Marija , “Control and Optimization Methods for Electric Smart Grids”, Springer, 2012.

22275E52DP

PRINCIPLES OF EHV TRANSMISSION**L T P C**
3 0 0 3**OBJECTIVES:**

To impart knowledge on,

- Types of power transmission and configurations various parameters and voltage gradients of transmission line conductors.
- The design requirements of EHV AC and DC lines.

UNIT I INTRODUCTION 9

Standard transmission voltages-AC and DC – different line configurations– average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

UNIT II CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – effect of ground return.

UNIT III VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers-I²R loss and corona loss-RIV.

UNIT IV ELECTROSTATIC FIELD AND DESIGN OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields – electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference, Design of EHV lines.

UNIT V HVDC LINES

Introduction- Reliability and failure issues-Design-tower, ROW, clearances, insulators, electrical and mechanical protection-Maintenance-Control and protection-D.C Electric field and Magnetic field -Regulations and guide lines-underground line design.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to model the transmission lines and estimate the voltage gradients and losses
- Ability to design EHV AC and DC transmission lines

REFERENCES

- 1 Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 2006.
- 2 Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., 2009.
- 3 Sunil S.Rao, "EHV-AC, HVDC Transmission & Distribution Engineering", Third Edition, Khanna Publishers, 2008.
- 4 William H. Bailey, Deborah E. Weil and James R. Stewart, "A Review on HVDC Power Transmission Environmental Issues", Oak Ridge National Laboratory.

- 5 J.C Molburg, J.A. Kavicky, and K.C. Picel ,”A report on The design, Construction and operation of Long-distance High-Voltage Electricity Transmission Technologies” Argonne (National Laboratory) 2007.
- 6 “Power Engineer’s Handbook”, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.

22272E53AP- SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion– Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.-simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-III)

22272E53BP - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN
LTPC 3 1 0 4

UNIT I MOTOR STARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

UNIT II POWER FACTOR CORRECTION STUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

UNIT III HARMONIC ANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

UNIT IV FLICKER ANALYSIS 9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

UNIT V GROUND GRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

Skill Development

Employability

Entrepreneurship

GA-discrete and continuous - Single objective and multi-objective problems - Procedures in evolutionary programming.

UNIT V**HYBRID CONTROL SCHEMES****9**

Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS – Fuzzy Neuron - Optimization of membership function and rule base using Genetic Algorithm – Introduction to Support Vector Machine - Evolutionary Programming-Particle Swarm Optimization - Case study – Familiarization of NN, FLC and ANFIS Tool Box.

TOTAL : 45 PERIODS**OUTCOMES:**

- Will be able to know the basic ANN architectures, algorithms and their limitations.
- Also will be able to know the different operations on the fuzzy sets.
- Will be capable of developing ANN based models and control schemes for non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.
- Will be competent to use hybrid control schemes and P.S.O and support vector Regressive.

TEXT BOOKS:

1. Laurene V. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms And Applications", Pearson Education.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India, 2008.
3. Zimmermann H.J. "Fuzzy set theory and its Applications" Springer international edition, 2011.
4. David E.Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, 2009.
5. W.T.Miller, R.S.Sutton and P.J.Webrose, "Neural Networks for Control" MIT Press", 1996.
6. T. Ross, "Fuzzy Logic with Engineering Applications", Tata McGraw Hill, New Delhi, 1995.
7. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)", MIT Press, 2004.
8. Corinna Cortes and V. Vapnik, " Support - Vector Networks, Machine Learning " 1995.

22272E53DP
OBJECTIVES:

RESTRUCTURED POWER SYSTEM

LTPC
3003

- To introduce the restructuring of power industry and market models.
- To impart knowledge on fundamental concepts of congestion management.
- To analyze the concepts of locational marginal pricing and financial transmission rights.
- To illustrate about various power sectors in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNIT II TRANSMISSION CONGESTION MANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing- Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequacy – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service –Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods –

Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

UNIT V REFORMS IN INDIAN POWER SECTOR 9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

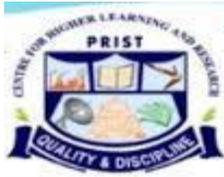
TOTAL : 45 PERIODS

OUTCOMES:

- Learners will have knowledge on restructuring of power industry
- Learners will understand basics of congestion management
- Learners will attain knowledge about locational margin prices and financial transmission rights
- Learners will understand the significance ancillary services and pricing of transmission network
- Learners will have knowledge on the various power sectors in India

REFERENCES

- 1 Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, “Restructured electrical power systems: operation, trading and volatility” Pub., 2001.
- 2 Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Bollen, “Operation of restructured power systems”, Kluwer Academic Pub., 2001.
- 3 Paranjothi, S.R. , “Modern Power Systems” Paranjothi, S.R. , New Age International, 2017.
- 4 Sally Hunt,” Making competition work in electricity”, John Willey and Sons Inc. 2002.
- 5 Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley & Sons, 2002.



PRIST
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NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

**DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING**

PROGRAM COURSE STRUCTURE-2022

M.TECH-POWERSYSTEMS(FULLTIME)[Regulation2022]

[For candidates admitted to M.Tech Power System
program from June 2022 onwards]

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME:M.TECH-POWER SYSTEMS(FULLTIME)

CURRICULUM-REGULATION 2022

SEMESTER-I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22248S11D	Applied Mathematics for Power System Engineering	3	1	0	4
2	22272C12	System Theory	3	1	0	4
3	22272C13	Advanced Power System Analysis	3	1	0	4
4	22272C14	Economic Operations of Power Systems	3	1	0	4
5	22272C15	HVDC and FACTS	3	1	0	4
6	22272E16_	Elective-I	3	0	0	3
7	22272L17	Power System Simulation Laboratory	0	0	3	3
TOTAL						26

SEMESTER-II

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C21	EHV power transmission	3	1	0	4
2	22272C22	Power System Control	3	1	0	4
3	22272C23	Advanced Power System Protection	3	1	0	4
4	22272E24_	Elective -II	3	0	0	3
5	22272E25_	Elective-III	3	0	0	3
6	22272L26	Advanced Power System Simulation Laboratory	0	0	3	3
7	222TECWR	Technical Writing/Seminars	0	0	3	3
TOTAL						24

SEMESTER-III

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C31	Electrical Transients in power systems	3	1	0	4
2	22272E32_	Elective -IV	3	0	0	3
3	22272E33_	Elective -V	3	0	0	3
4	22272E34_	Elective -VI	3	0	0	3
5	22272P35	Project work Phase-I	0	0	10	10
TOTAL						23

SEMESTER-IV

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272P41	Project work Phase-II	0	0	15	15

Elective -I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E16A	Analysis of Inverters	3	0	0	3
2.	22272E16B	Modeling and Analysis of Electrical Machines	3	0	0	3
3.	22272E16C	Advanced Power System Dynamics	3	0	0	3
4.	22272E16D	Analysis and Computation of Electromagnetic Transients in Power Systems	3	0	0	3

Elective -II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E24A	Smart Grid	3	0	0	3
2.	22272E24B	Solar and Energy Storage Systems	3	0	0	3
3.	22272E24C	Power System Reliability	3	0	0	3
4.	22272E24D	Distributed Generation And Microgrid	3	0	0	3

Elective-III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E25A	Wind Energy conversion Systems	3	0	0	3
2.	22272E25B	AI Techniques to Power Systems	3	0	0	3
3.	22272E25C	Electrical Distribution	3	0	0	3
4.	22272E25D	Energy Management and Auditing	3	0	0	3

Elective -IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E32A	Power Electronics applications in Power Systems	3	0	0	3
2.	22272E32B	Power systemDynamics	3	0	0	3
3.	22272E32C	Electric Vehicles and Power Management	3	0	0	3
4.	22272E32D	Electromagnetic Interference and Compatibility	3	0	0	3

Elective -V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E33A	Power Conditioning	3	0	0	3
2.	22272E33B	Deregulated Power System	3	0	0	3
3.	22272E33C	Control System Design for Power Electronics	3	0	0	3
4.	22272E33D	Principles of EHV Transmission	3	0	0	3

Elective -VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E34A	Software for Control system Design	3	0	0	3
2.	22272E34B	Industrial Power system Analysis and design	3	0	0	3
3.	22272E34C	Soft Computing Techniques	3	0	0	3
4.	22272E34D	Restructured Power System	3	0	0	3

TotalCredits=88

CreditDistribution

Sem.	CoreCourses				Elective Courses		Total Credits
	Theory Courses		Practical Courses		Nos.	Credits	
	Nos.	Credits	Nos.	Credits			
I	04	16	01	03	01	03	26
II	03	12	02	06	02	06	24
III	01	04	-	-	03	09	23
IV	-	-	-	-	-	-	15
Total Credits							88

HOD

DEAN

22248S11D -APPLIED MATHEMATICS for POWER SYSTEM ENGINEERING
ENGINEERING 3104

- 1. ADVANCED MATRIX THEORY 9**
Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.
- 2. RANDOM PROCESSES 9**
Random variable, discrete, continuous types-Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes -Auto-correlation – Cross correlation.
- 3. LINEAR PROGRAMMING 9**
Basic concepts – Graphical and Simplex methods – Transportation problem – Assignment problem.
- 4. DYNAMIC PROGRAMMING 9**
Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.
- 5. INTEGRAL TRANSFORMS 9**
Finite Fourier transform-Fourier series-Finite sine transform-Cosine transform -finite Hankel transform - definition, Transform of $\frac{df}{dx}$ where p is a root of $J_n(p)=0$, Transform of
- $$\frac{d^2f}{dx^2} + p^2 f, \text{ and Transform of } \frac{d^2f}{dx^2} - p^2 f$$
- $$L = 45T = 15P = 0C = 4$$

REFERENCES

- Lewis, D.W., Matrix Theory, Allied Publishers, Chennai 1995.
- Bronson, R., Matrix Operations, Schaum's outline Series, McGraw Hill, New York. 1989.
- Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillan, New York, 1988.
- Taha, H.A., "Operations research - An Introduction", Mac Millan publishing Co., (1982).
- Gupta, P.K. and Hira, D.S., "Operations Research", S. Chand & Co., New Delhi, (1999). 6..
- Ochi, M.K. "Applied Probability and Stochastic Processes", John Wiley & Sons (1992).
- Peebles Jr., P.Z., "Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT 9

Systems-electrical-mechanical-hydraulic-pneumatic-thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS 9

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS-FREQUENCY DOMAIN DESCRIPTIONS 9

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS 9

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY 9

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. M.Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S.Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umezand Eroni, 'System dynamics & Control', Thomson Brooks/ Cole, 1998.
4. K.Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J.Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S.Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

22272C13-ADVANCED POWER SYSTEM ANALYSIS

3 1 0 4

OBJECTIVES:

- To introduce different techniques of dealing with sparse matrix for large scale power systems.
- To impart in-depth knowledge on different methods of power flow solutions.
- To perform optimal power flow solutions in detail.
- To perform short circuit fault analysis and understand the consequence of different type of faults.
- To illustrate different numerical integration methods and factors influencing transient stability

UNIT I SOLUTION TECHNIQUE 9
 Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

UNIT II POWERFLOW ANALYSIS 9
 Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment..

UNIT III OPTIMAL POWERFLOW 9
 Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

UNIT IV SHORTCIRCUIT ANALYSIS 9
 Formation of bus impedance matrix with mutual coupling (single phase basis and three phase basis)-Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase – symmetrical and unsymmetrical faults.

UNIT V TRANSIENT STABILITY ANALYSIS 9
 Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

$$L = 45T = 15P = 0C = 4$$

OUTCOMES:

- Ability to apply the concepts of sparse matrix for large scale power system analysis
- Ability to analyze power system studies that needed for the transmission system planning.

REFERENCES:

1. A.J.WoodandB.F.Wollenberg,“PowerGenerationOperationandControl”,JohnWileyand sons, New York, 1996.
2. W.F.Tinney and W.S.Meyer, “Solution of Large Sparse System by Ordered Triangular Factorization” IEEE Trans. on Automatic Control, Vol : AC-18, pp:333346 Aug 1973.
- 3.K.Zollenkopf, “Bi-Factorization: Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on “Large Sparse Set of Linear Systems” Editor: J.K.Rerd,Academic Press, 1971.
4. M.A.Pai,”ComputerTechniquesinPowerSystemAnalysis”,TataMcGraw-HillPublishing Company Limited, New Delhi, 2006.
5. GWStagg,A.HEI.Abiad,“ComputerMethodsInPowerSystemAnalysis”, McGrawHill, 1968.
6. P.Kundur,“PowerSystem StabilityandControl”, McGrawHill, 1994.

22272C14-ECONOMIC OPERATIONS OF POWER SYSTEMS**3104****1. INTRODUCTION****9**

Planning and operational problems of power systems – review of economic dispatch and calculation using Bmatrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWERFLOW PROBLEM**9**

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal siting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDROTHERMAL SCHEDULING**9**

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT**9**

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING**9**

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. Allen J. Wood and Bruce F. Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K., "Economic control of interconnected systems", John Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy system theory – an introduction", McGraw Hill, New Delhi, 1971.

22272C15-HVDCANDFACTS**3104****OBJECTIVES:**

- To emphasize the need for FACTS controllers.
- To learn the characteristics, applications and modeling of series and controllers.
- To analyze the interaction of different FACTS controller and coordination
- To impart knowledge on operation, modelling and control of HVDC link.
- To perform steady state analysis of AC/DC system.

UNIT I	INTRODUCTION	9
Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation: Effect of series and shunt compensation at the mid-point of the line on power transfer- Need for FACTS controllers- types of FACTS controllers. Comparison of AC & DC Transmission, Applications of DC Transmission Topologies.		
UNIT II	SVC&STATCOM	9
Configuration of SVC- voltage regulation by SVC- Modelling of SVC for load flow analysis Design of SVC to regulate the mid-point voltage of a SMIB system- Applications Static synchronous compensator(STATCOM)- Operation of STATCOM – Voltage regulation – Power flow control with STATCOM.		
UNIT III	TCSC and SSSC	9
Concepts of Controlled Series Compensation-Operation of TCSC-Analysis of TCSC operation - Modelling of TCSC for load flow studies - Static synchronous series compensator (SSSC)- Operation of SSSC - Modelling of SSSC for power flow – operation of Unified power flow controllers(UPFC).		
UNIT IV	ANALYSIS OF HVDC LINK	9
Simplified analysis of six pulse Graetz bridge- Characteristics- Analysis of converter operations- Commutation overlap- Equivalent circuit of bipolar DC transmission link- Modes of operation – Mode ambiguity – Different firing angle controllers – Power flow control. UNIT V		
POWER FLOW ANALYSIS IN AC/DC SYSTEMS		9
Per unit system for DC Quantities- Modelling of DC links- Solution of DC load flow- Solution of AC-DC power flow – Unified and Sequential methods.		

TOTAL : 45 PERIODS**OUTCOMES:**

- Learners will be able to refresh on basics of power transmission networks and need for FACTS controllers
- Learners will understand the significance about different voltage source converter based FACTS controllers
- Learners will understand the significance of HVDC converters and HVDC system control
- Learners will attain knowledge on AC/DC power flow analysis

REFERENCES

1. Mohan Mathur, R., Rajiv. K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", IEEE Press and John Wiley & Sons, Inc.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd., Publishers, New Delhi, Reprint 2008.
3. K. R. Padiyar, "HVDC Power Transmission Systems", New Age International (P) Ltd., New Delhi, 2002.
4. J. Arrillaga, "High Voltage Direct Current Transmission", Peter Pregrinus, London, 1983.
5. V. K. Sood, "HVDC and FACTS Controllers - Applications of Static Converters in Power System", Kluwer Academic Publishers 2004

OBJECTIVES:

- To have hands on experience on various system studies and different techniques used
- for system planning using Software packages
- To perform the dynamic analysis of power system
-

LIST OF EXPERIMENTS

1. Power flow analysis by Newton-Raphson method and Fast decoupled method

2. Transient stability analysis of single machine-infinite bus system using classical machine model

3. Contingency analysis: Generator shift factors and line outage distribution factors

4. Economic dispatch using lambda-iteration method

5. Unit commitment: Priority-lists schemes and dynamic programming

6. State Estimation (DC)

7. Analysis of switching surge using EMTP: Energisation of a long distributed-parameter line

8. Analysis of switching surge using EMTP : Computation of transient recovery voltage

9. Simulation and Implementation of Voltage Source Inverter

10. Digital Over Current Relay Setting and Relay Coordination using Suitable software packages 11

Co-ordination of over-current and distance relays for radial line protection

TOTAL: 60 PERIODS

OUTCOMES:

- Upon Completion of the course, the students will be able to:
- Analyze the power flow using Newton-Raphson method and Fast decoupled method.
- Perform contingency analysis & economic dispatch
- Set Digital Over Current Relay and Coordinate Relay

22272C21-EHVPOWERTRANSMISSION

3104

1. INTRODUCTION**9**

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS**9**

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS**9**

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS**9**

Power losses and audible losses: I²R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES**9**

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines-effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer's Handbook, Revised and Enlarged 6th Edition, TNEB Engineers' Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

1. AUTOMATIC GENERATION CONTROL**9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL**9**

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT**9**

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION**9**

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system – computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM**9**

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. Kundur.P., "powersystem stability and control", McGrawHill, 1994.
2. Anderson P.M., and Fouad A.A., "powersystem control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "powersystems voltage stability", McGrawHill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Cstem, C. Vournas, "voltage stability of power system", Kluwer Academic Publishers, 1998.
7. Elgerd O.L., "Electric energy system theory – an introduction", McGrawHill, New Delhi, 1971.

OBJECTIVES:

- To illustrate concepts of transformer protection
- To describe about the various schemes of Overcurrent protection
- To analyze distance and carrier protection
- To familiarize the concepts of Generator protection and Numerical protection

UNIT I OVERCURRENT & EARTH FAULT PROTECTION 9

Zones of protection – Primary and Backup protection – operating principles and Relay Construction - Time – Current characteristics-Current setting – Time setting-Over current protective schemes –Concept of Coordination - Protection of parallel / ring feeders – Reverse power or directional relay –Polarisation Techniques – Cross Polarisation – Quadrature Connection -Earth fault and phase fault protection - Combined Earth fault and phase fault protection scheme - Phase fault protective - scheme directional earth fault relay - Static over current relays –Numerical over-current protection; numerical coordination example for a radial feeder

UNIT II TRANSFORMER & BUSBAR PROTECTION 9

Types of transformers –Types of faults in transformers- Types of Differential Protection – High Impedance – External fault with one CT saturation – Actual behaviors of a protective CT – Circuit model of a saturated CT - Need for high impedance – Disadvantages - Percentage Differential Bias Characteristics – Vector group & its impact on differential protection - Inrush phenomenon – Zero Sequence filtering – High resistance Ground Faults in Transformers – Restricted Earth fault Protection - Inter-turn faults in transformers – Incipient faults in transformers - Phenomenon of overfluxing in transformers – Transformer protection application chart. Differential protection of busbars external and internal fault - Supervisory relay-protection of three – Phase busbars – Numerical examples on design of high impedance busbar differential scheme –Biased Differential Characteristics – Comparison between Transformer differential & Busbar differential.

UNIT III DISTANCE AND CARRIER PROTECTION OF TRANSMISSION LINES 9

Drawback of over-Current protection –Introduction to distance relay –Simple impedance relay – Reactance relay – mho relays comparison of distance relay – Distance protection of a three – Phase line-reasons for inaccuracy of distance relay reach -Three stepped distance protection Trip contact configuration for the three - Stepped distance protection - Three-stepped protection of three-phase line against all ten shunt faults - Impedance seen from relay side - Three-stepped protection of double end fed lines-need for carrier – Aided protection – Various options for a carrier –Coupling and trapping the carrier into the desired line section - Unit type carrier aided directional comparison relaying – Carrier aided distance schemes for acceleration of zone II; numerical example for a typical distance protection scheme for a transmission line.

UNIT IV GENERATOR PROTECTION

Electrical circuit of the generator – Various faults and abnormal operating conditions – Stator Winding Faults – Protection against Stator (earth) faults – third harmonic voltage protection – Rotor fault – Abnormal operating conditions - Protection against Rotor faults – Potentiometer Method – injection method – Pole slipping – Loss of excitation – Protection against Mechanical faults; Numerical examples for typical generator protection schemes

UNIT V NUMERICAL PROTECTION

Introduction – Block diagram of numerical relay – Sampling theorem – Correlation with reference (LES) technique – Digital filtering – numerical over - Current protection – Numerical transformer differential protection – Numerical distance protection of transmission line

$$L = 45T = 15P = 0C = 4$$

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- Learners will have knowledge on Overcurrent protection.
- Learners will attain knowledge about Distance and Carrier protection in transmission lines.
- Learners will understand the concepts of Generator protection.
- Learners will attain basic knowledge on substation automation.

REFERENCES

- 1 Y.G. Paithankar and S.R. Bhide, “Fundamentals of Power System Protection”, Prentice-Hall of India, 2003
- 2 Badri Ram and D.N. Vishwakarma, “Power System Protection and Switchgear”, Tata McGraw-Hill Publishing Company, 2002.
- 3 T.S.M. Rao, “Digital Relay/Numerical relays”, Tata McGraw Hill, New Delhi, 1989.
- 4 P. Kundur, “Power System Stability and Control”, McGraw-Hill, 1993.

22272L26 ADVANCED POWERS SYSTEMS SIMULATION LABORATORY
LTPC**0 0 4 2****OBJECTIVES:**

- To analyze the effect of FACTS controllers by performing steady state analysis.
- To have hands on experience on different wind energy conversion technologies

LIST OF EXPERIMENTS

1. Small-signal stability analysis of single machine-infinite bus system using classical machine model
2. Small-signal stability analysis of multi-machine configuration with classical machine model
3. Induction motor starting analysis
4. Load flow analysis of two-bus system with STATCOM
5. Transient analysis of two-bus system with STATCOM
6. Available Transfer Capability calculation using an existing load flow program
7. Study of variable speed wind energy conversion system- DFIG
8. Study of variable speed wind energy conversion system- PMSG
9. Computation of harmonic indices generated by a rectifier feeding a R-L load
10. Design of active filter for mitigating harmonics

22272C31-ELECTRICAL TRANSIENTS IN POWER SYSTEMS

3104

- 1. TRAVELLING WAVES ON TRANSMISSION LINE 9**
Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.
- 2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9**
Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.
- 3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9**
Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)
- 4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9**
Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor
- 5. INSULATION CO-ORDINATION 9**
Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level – overvoltage protective devices – lightning arresters, substation earthing.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., 1996.
2. Allan Greenwood, "Electrical Transients in Power System", Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, "Surges in High Voltage Networks", Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, "High Voltage Engineering", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09(1988), 'Very fast transient phenomena associated with Gas Insulated System', CIGRE, 33-13, pp. 1-2

OBJECTIVES:

- To determine the operation and characteristics of controlled rectifiers.
- To apply switching techniques and basic topologies of DC-DC switching regulators.
- To introduce the design of power converter components.
- To provide an in depth knowledge about resonant converters.
- To comprehend the concepts of AC-AC power converters and their applications.

UNIT I SINGLE PHASE & THREE PHASE CONVERTERS 9

Principle of phase controlled converter operation – single-phase full converter and semi-converter (RL, RLE load) – single phase dual converter – Three phase operation full converter and semi-converter (R, RL, RLE load) – reactive power – power factor improvement techniques – PWM rectifiers.

UNIT II DC-DC CONVERTERS 9

Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk & SEPIC – under continuous and discontinuous operation – Isolated converters: basic operation of Flyback, Forward and Push-pull topologies.

UNIT III DESIGN OF POWER CONVERTER COMPONENTS 9

Introduction to magnetic materials- hard and soft magnetic materials – types of cores, copper windings – Design of transformer – Inductor design equations – Examples of inductor design for buck/flyback converter – selection of output filter capacitors – selection of ratings for devices – input filter design.

UNIT IV RESONANT DC-DC CONVERTERS 9

Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters- load resonant converters – series and parallel – resonant switch converters – operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS-Introduction to ZVT/ZCT PWM converters.

UNIT V AC-AC CONVERTERS 9

Principle of on-off and phase angle control – single phase ac voltage controller – analysis with R & RL load – Three phase ac voltage controller – principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course the student will be able to:

- Analyze various single phase and three phase power converters
- Select and design dc-dc converter topologies for a broad range of power conversion applications.
- Develop improved power converters for any stringent application requirements.
- Design ac-ac converters for variable frequency applications.

TEXT BOOKS:

- 1 Ned Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: converters, Application and design" John Wiley and sons. Wiley India edition, 2006.
- 2 Rashid M. H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, Third Edition, New Delhi, 2004.
- 3 P. C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.
- 4 P. S. Bimbra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003
- 5 Simon Ang, Alejandro Oliva, "Power-Switching Converters, Second Edition, CRC Press, Taylor & Francis Group, 2010
- 6 V. Ramanarayanan, "Course material on Switched mode power conversion", 2007
- 7 Alex Van den Bossche and Vencislav Cekov Valchev, "Inductors and Transformers for Power Electronics", CRC Press, Taylor & Francis Group, 2005
- 8 W. G. Hurley and W. H. Wolfe, "Transformers and Inductors for Power Electronics Theory, Design and Applications", 2013 John Wiley & Sons Ltd.
- 9 Marian. K. Kazimierczuk and Dariusz Czarkowski, "Resonant Power Converters", John Wiley & Sons limited, 2011

22272E16B-MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3104

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION

General expression of stored magnetic energy-co-energy and force/torque-example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$$L = 45T = 15P = 0C = 4$$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

OBJECTIVES:**3003**

- To perform transient stability analysis using unified algorithm.
- To impart knowledge on sub-synchronous resonance and oscillations
- To analyze voltage stability problem in power system.
- To familiarize the methods of transient stability enhancement

UNIT I TRANSIENT STABILITY ANALYSIS**9**

Review of numerical integration methods: Euler and Fourth Order Runge-Kutta methods, Numerical stability and implicit methods, Interfacing of Synchronous machine (variable voltage) model to the transient stability algorithm (TSA) with partitioned – explicit and implicit approaches – Interfacing SVC with TSA-methods to enhance transient stability

UNIT II UNIFIED ALGORITHM FOR DYNAMIC ANALYSIS OF POWER SYSTEMS**9**

Need for unified algorithm- numerical integration algorithmic steps-truncation error-variable step size – handling the discontinuities- numerical stability- application of the algorithm for transient. Mid-term and long-term stability simulations

UNIT III SUBSYNCHRONOUS RESONANCE (SSR) AND OSCILLATIONS**9**

Sub synchronous Resonance (SSR) – Types of SSR - Characteristics of series – Compensated transmission systems – Modeling of turbine-generator-transmission network- Self-excitation due to induction generator effect – Torsional interaction resulting in SSR – Methods of analyzing SSR – Numerical examples illustrating instability of subsynchronous oscillations – time-domain simulation of subsynchronous resonance – EMTF with detailed synchronous machine model- Turbine Generator Torsional Characteristics: Shaft system model – Examples of torsional characteristics – Torsional Interaction with Power System Controls: Interaction with generator excitation controls – Interaction with speed governors – Interaction with nearby DC converters

UNIT IV TRANSMISSION, GENERATION AND LOAD ASPECTS OF VOLTAGE STABILITY ANALYSIS**9**

Review of transmission aspects – Generation Aspects: Review of synchronous machine theory – Voltage and frequency controllers – Limiting devices affecting voltage stability – Voltage-reactive power characteristics of synchronous generators – Capability curves – Effect of machine limitation on deliverable power – Load Aspects – Voltage dependence of loads – Load restoration dynamics – Induction motors – Load tap changers – Thermostatic load recovery – General aggregate load models.

UNIT V ENHANCEMENT OF TRANSIENT STABILITY AND COUNTERMEASURES FOR SUBSYNCHRONOUS RESONANCE**9**

Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic

braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving, high-speed excitation systems; NGH damper scheme.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- Learners will have knowledge on Overcurrent protection.
- Learners will attain knowledge about Distance and Carrier protection in transmission lines.
- Learners will understand the concepts of Busbar protection.
- Learners will attain basic knowledge on numerical protection techniques

REFERENCES

- 1 R.Ramnujam, "Power System Dynamics Analysis and Simulation", PHI Learning Private Limited, New Delhi, 2009
- 2 T.V.Cutsem and C.Vournas, "Voltage Stability of Electric Power Systems", Kluwer publishers, 1998
- 3 P.Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
- 4 H.W. Dommel and N.Sato, "Fast Transient Stability Solutions," IEEE Trans., Vol. PAS-91, pp, 1643-1650, July/August 1972.
- 5 Roderick J . Frowd and J. C. Giri, "Transient stability and Long term dynamics unified", IEEE Trans., Vol 101, No. 10, October 1982.
- 6 M.Stubbe, A.Bihain, J.Deuse, J.C.Baader, "A New Unified software program for the study of the dynamic behaviour of electrical power system" IEEE Transaction, Power Systems, Vol.4.No.1, Feb:1989 Pg.129 to 138

OBJECTIVES:

- To understand the various types of transients and its analysis in power system.
- To learn about modeling and computational aspects of transients computation

UNIT I REVIEW OF TRAVELLING WAVE PHENOMENA 9
Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behaviour of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion.

UNIT II LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9
Lightning overvoltages: interaction between lightning and power system- ground wire voltage and voltage across insulator; switching overvoltage: Short line or kilometric fault, energizing transients - closing and re-closing of lines, methods of control; temporary overvoltages: line dropping, load rejection; voltage induced by fault; very fast transient overvoltage (VFTO).

UNIT III PARAMETERS AND MODELING OF OVERHEAD LINES 9
Review of line parameters for simple configurations: series resistance, inductance and shunt capacitance; bundle conductors : equivalent GMR and equivalent radius; modal propagation in transmission lines: modes on multi-phase transposed transmission lines, α - β -0 transformation and symmetrical components transformation, modal impedances; analysis of modes on untransposed lines; effect of ground return and skin effect; transposition schemes;

UNIT IV FAST TRANSIENT PHENOMENON IN AIS AND DGIS 9
Digital computation of line parameters: why line parameter evaluation programs? Salient features of a typical line parameter evaluation program; constructional features of that affect transmission line parameters; line parameters for physical and equivalent phase conductors elimination of ground wires bundling of conductors; principle of digital computation of transients: features and capabilities of electromagnetic transients program; steady state and time step solution modules: basic solution methods; case studies on simulation of various types of transients

TOTAL: 45 PERIODS**OUTCOMES:**

- Learners will be able to model over head lines, cables and transformers.
- Learners will be able to analyze power system transients.

REFERENCES

- 1 Allan Greenwood, "Electrical Transients in Power System", Wiley & Sons Inc. New York, 1991.
- 2 R. Ramanujam, "Computational Electromagnetic Transients: Modeling, Solution Methods and Simulation", I.K. International Publishing House Pvt. Ltd, New Delhi, 2014.
- 3 Naidu M S and Kamaraju V, "High Voltage Engineering", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.

22272E24A

SMARTGRID

LTPC

3003

OBJECTIVES:

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID**9**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES**9**

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE**9**

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID**9**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS**9**

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- Learners will study about different Smart Grid technologies.
- Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid application

REFERENCES

- 1 Stuart Borlase "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.
- 2 Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2012.
- 3 Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.
- 4 Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids, vol. 14, 2012.

OBJECTIVES:

- To Study about solar modules and PV system design and their applications
- To Deal with grid connected PV systems
- To Discuss about different energy storage systems

UNIT I INTRODUCTION	9
Characteristic of sunlight – semiconductors and P-N junctions – behavior of solar cells – cell properties – PV cell interconnection	
UNIT II STANDALONE PV SYSTEM	9
Solar modules – storage systems – power conditioning and regulation - MPPT- protection – stand alone PV systems design – sizing	
UNIT III GRID CONNECTED PV SYSTEMS	9
PV systems in buildings – design issues for central power stations – safety – Economic aspect – Efficiency and performance - International PV programs	
UNIT IV ENERGY STORAGE SYSTEMS	9
Impact of intermittent generation – Battery energy storage – solar thermal energy storage – pumped hydroelectric energy storage	
UNIT V APPLICATIONS	9
Water pumping – battery chargers – solar car – direct-drive applications – Space – Telecommunications.	
TOTAL: 45 PERIODS	

OUTCOMES:

- Students will develop more understanding on solar energy storage systems
- Students will develop basic knowledge on stand alone PV system
- Students will understand the issues in grid connected PV systems
- Students will study about the modeling of different energy storage systems and their performances
- Students will attain more on different applications of solar energy

REFERENCES

- 1 Solanki C.S., "Solar Photovoltaics: Fundamentals, Technologies And Applications", PHI Learning Pvt. Ltd., 2015.

- 2 Stuart R.Wenham, Martin A.Green, Muriel E. Watt and Richard Corkish, "Applied Photovoltaics", 2007,Earthscan, UK. Eduardo Lorenzo G. Araujo, "Solar electricity engineering of photovoltaicsystems", Progensa,1994.
- 3 FrankS.Barnes&JonahG.Levine,"LargeEnergyStorageSystemsHandbook",CRC Press, 2011.
- 4 McNeils,Frenkel,Desai,"Solar&WindEnergyTechnologies",WileyEastern, 1990
- 5 S.P.Sukhatme,"SolarEnergy",TataMcGrawHill,1987.

OBJECTIVES:**3003**

- To introduce the objectives of Load forecasting.
- To study the fundamentals of Generation system, transmission system and Distribution system reliability analysis
- To illustrate the basic concepts of Expansion planning

UNIT I	LOAD FORECASTING	9
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Objectives of forecasting-Load growth patterns and their importance in planning-Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

UNIT II	GENERATION SYSTEM RELIABILITY ANALYSIS	9
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Probabilistic generation and load models-Determination of LOLP and expected value of demand not served –Determination of reliability of ISO and interconnected generation systems

UNIT III	TRANSMISSION SYSTEM RELIABILITY ANALYSIS	9
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Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served

UNIT IV	EXPANSION PLANNING	9
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Basic concepts on expansion planning-procedure followed for integrated transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distribution system.

UNIT V	DISTRIBUTION SYSTEM PLANNING OVERVIEW	9
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Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

TOTAL:45 PERIODS**OUTCOMES:**

- Students will develop the ability to learn about load forecasting.
- Students will learn about reliability analysis of ISO and interconnected systems.
- Students will understand the concepts of Contingency analysis and Probabilistic Load flow Analysis
- Students will be able to understand the concepts of Expansion planning
- Students will have knowledge on the fundamental concepts of the Distribution system planning

REFERENCES

- 1 Roy Billinton & Ronald N. Allan, "Reliability Evaluation of Power Systems" Springer Publication,
- 2 R.L. Sullivan, "Power System Planning", Tata McGraw Hill Publishing Company Ltd 1977.
- 3 X. Wang & J.R. McDonald, "Modern Power System Planning", McGraw Hill Book Company 1994.
- 4 T. Gonen, "Electrical Power Distribution Engineering", McGraw Hill Book Company 1986.
- 5 B.R. Gupta, "Generation of Electrical Energy", S. Chand Publications 1983.

OBJECTIVES:**3003**

- Toillustratetheconceptofdistributedgeneration
- Toanalyzetheimpactofgridintegration.
- TostudyconceptofMicrogridandits configuration

UNIT I	INTRODUCTION	9
Conventional powergeneration:advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.		
UNIT II	DISTRIBUTEDGENERATIONS(DG)	9
Concept of distributed generations, topologies, selection of sources, regulatory standards/framework, Standards forinterconnectingDistributedresources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants		
UNIT III	IMPACTOFGRIDINTEGRATION	9
Requirements for grid interconnection, limits on operational parameters,: voltage, frequency,THD,responsetogridabnormaloperatingconditions,islandingissues.Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.		
UNIT IV	BASICSOFA MICROGRID	9
Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids,Power Electronics interfaces in DC and AC microgrids		
UNIT V	CONTROLANDOPERATIONOFMICROGRID	9
Modesofoperationandcontrolofmicrogrid:gridconnectedandislandedmode,Activeand reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.		
TOTAL:45PERIODS		

OUTCOMES:

- Learnerswillattainknowledgeonthevariouschemesofconventionaland

nonconventional power generation.

- Learners will have knowledge on the topologies and energy sources of distributed generation.
- Learners will learn about the requirements for grid interconnection and its impact with NCE sources
- Learners will understand the fundamental concept of Microgrid.

REFERENCES

- 1 Amirnaser Yezdani, and Reza Iravani, "Voltage Source Converters in Power Systems: Modeling, Control and Applications", IEEE John Wiley Publications, 2010.
- 2 Dorin Neacsu, "Power Switching Converters: Medium and High Power", CRC Press, Taylor & Francis, 2006
- 3 Chetan Singh Solanki, "Solar Photo Voltaics", PHI learning Pvt. Ltd., New Delhi, 2009
- 4 J.F. Manwell, J.G. McGowan "Wind Energy Explained, theory design and applications", Wiley publication 2010.
- 5 D.D. Hall and R.P. Grover, "Biomass Regenerable Energy", John Wiley, New York, 1987.
- 6 John Twidell and Tony Weir, "Renewable Energy Resources" Tylor and Francis Publications, Second edition 2006.

22272E25A-WINDENERGYCONVERSIONSYSTEMS**3104****UNIT-I-INTRODUCTION: 9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER**GENERATION: 9**

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production- variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS: 9

Average wind speed and other factors affecting choice of the site- Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments- anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND**CONTROL ASPECTS: 9**

Asynchronous systems- Ac Generators- Self excitation of Induction Generator- Single Phase operation of Induction Generator- Permanent magnet Generators- Basic control aspects- fixed speed ratio control scheme- fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY 9

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L=45 T=15 P=0 C=4**REFERENCES:**

1. N.G. Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin & co. Ltd, London, 1979.
2. Gerald W. Koepfel, "Pirnam's and Power from the wind", Van Nostrand Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. L. Freris, Prentice Hall (U.K) Ltd., 1990.

22272E25B-AITECHNIQUESTOPOWERSYSTEMS

3104

1. INTRODUCTIONTONEURAL NETWORKS**9**

Basics of ANN - perceptron - delta learning rule - back propagation algorithm -multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONSTOPOWERSYSTEM PROBLEMS**9**

Applicationofneuralnetworkstoloadforecasting -contingencyanalysis -VARcontrol-economic load dispatch.

3. INTRODUCTIONTOFUZZYLOGIC**9**

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONSTOPOWERSYSTEMS**9**

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETICALGORITHMANDITSAPPLICATIONSTOPOWERSYSTEMS**9**

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

$$L = 45T = 15P=0C =4$$

REFERENCES:

1. JamesA.FreemanandSkapura.B.M,,NeuralNetworks-AlgorithmApplicationsand Programming Techniques", Addison Wesley, 1990.
2. GeorgeKlirandTinaFolger.A,,Fuzzy sets,Uncertainty andInformation",PrenticeHalof India, 1993.
3. Zimmerman.H.J,,FuzzySetTheoryanditsApplications",KluwerAcademicPublishers 1994.
4. IEEEtutorialon,,ApplicationofNeuralNetworktoPowerSystems",1996.
5. LoiLeiLai,,IntelligentSystemApplicationsinPowerEngineering",JohnWiley&SonsLtd.,1998.

OBJECTIVES:**3003**

- To provide knowledge about the distribution system electrical characteristics
- To gain knowledge about planning and designing of distribution system
- To analyze power quality in distribution system
- To analyze the power flow in balanced and unbalanced system

UNIT I	INTRODUCTION	9
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Distribution System-Distribution Feeder Electrical Characteristics-Nature of Loads : Individual Customer Load, Distribution Transformer Loading and Feeder Load -Approximate Method of Analysis: Voltage Drop, Line Impedance, "K" Factors, Uniformly Distributed Loads and Lumping Loads in Geometric Configurations.

UNIT II	DISTRIBUTION SYSTEM PLANNING	9
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Factors effecting planning, present techniques, planning models (Short term planning, long term planning and dynamic planning), planning in the future, future nature of distribution planning, Role of computer in Distribution planning. Load forecast, Load characteristics and Load models.

UNIT III	DISTRIBUTION SYSTEM LINE MODEL	9
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Exact Line Segment Model-Modified Line Model-Approximate Line Segment Model-Modified "Ladder" Iterative Technique-General Matrices for Parallel Lines.

UNIT IV	VOLTAGE REGULATION	9
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Standard Voltage Ratings-Two-Winding Transformer Theory-Two-Winding Autotransformer-Step-Voltage Regulators: Single-Phase Step-Voltage Regulators-Three-Phase Step-Voltage Regulators-Application of capacitors in Distribution system.

UNIT V	DISTRIBUTION FEEDER ANALYSIS	9
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Power-Flow Analysis- Ladder Iterative Technique -Unbalanced Three-Phase Distribution Feeder-Modified Ladder Iterative Technique-Load Allocation-Short-Circuit Studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- Ability to apply the concepts of planning and design of distribution system for utility systems
- Ability to implement the concepts of voltage control in distribution system.
- Ability to analyze the power flow in balanced and unbalanced system

REFERENCES

1. WilliamH.Kersting,"DistributionSystemModelingandAnalysis"CRCpress3rd edition,2012.

2. TuranGonen, "ElectricPowerDistributionSystemEngineering", McGrawHillCompany. 1986
3. JamesNorthcote-Green, RobertWilson, "ControlandAutomationofElectricalPower Distribution Systems", CRCPress, NewYork, 2007.
4. PablaHS, "ElectricalPowerDistributionSystems", TataMcGrawHill.2004

OBJECTIVES:

3003

- TostudytheconceptsbehindeconomicanalysisandLoadmanagement.
- Toemphasizetheenergymanagementonvariouselectricalequipmentsandmetering.
- Toillustratetheconceptoflightingsystemsandcogeneration.

UNIT I INTRODUCTION 9

Needforenergymanagement-energybasics-designingandstartinganenergymanagement program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNIT II ENERGYCOSTANDLOADMANAGEMENT 9

Importantconceptsineconomicanalysis-Economicmodels-Timevalueofmoney-Utility rate structures- cost of electricity-Loss evaluation- Load management: Demand control techniques-Utilitymonitoringandcontrolsystem-HVACandenergymanagement-Economic justification.

UNIT III ENERGYMANAGEMENTFORMOTORS,SYSTEMS,ANDELECTRICAL EQUIPMENT 9

Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines.

UNIT IV METERINGFORENERGYMANAGEMENT 9

Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering locationvs.requirements-Meteringtechniquesandpracticalexamples.

UNIT V LIGHTINGSYSTEMS& COGENERATION 9

Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldeveloptheabilitytolearnabouttheneedforenergymanagementand auditingprocess
- Learnerswilllearnaboutbasicconceptsofeconomicanalysisandloadmanagement.
- Studentswillunderstandtheenergymanagementonvariouselectricalequipments.
- Studentswillhaveknowledgeontheconceptsofmeteringandfactorsinfluencingcost function

- Students will be able to learn about the concept of lighting systems, light sources and various forms of cogeneration

REFERENCES

- 1 Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, "Guideto Energy Management", Fifth Edition, The Fairmont Press, Inc., 2006
- 2 Eastop T. D. & Croft D. R., "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, 1990.
- 3 Reay D. A., "Industrial Energy Conservation", 1st edition, Pergamon Press, 1977.
- 4 "IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities", IEEE, 1996
- 5 Amit K. Tyagi, "Handbook on Energy Audits and Management", TERI, 2003.

22272E32A-POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS**3104****UNIT: I STATIC COMPENSATOR CONTROL****9**

Theory of load compensation-voltage regulation and power factor correction- phase balance and PF correction of unsymmetrical loads-Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) - Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT**9**

Input power factor for different types of converters-power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS**9**

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL**9**

Solid state excitation of synchronous generators - Different schemes - Genex excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM**9**

Parallel, Redundant and non-redundant UPS - UPS using resonant power converters - Switch mode power supplies.

L = 45T = 15P = 0C = 4**TEXTBOOK**

Miller.T.J.E,“Reactive power control in Electric systems”.Wiley interscience,New York, 1982.

REFERENCES

1. “Static Compensator for AC power systems”, Proc. IEE vol.128 Nov.1981.pp 362-406.
2. “A static alternative to the transformer on load tap changing”, IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. “Improvements in Thyristor controlled static on-load tap controllers for transformers”, IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. “Shunt Thyristor rectifiers for the Genex Excitation systems”, IEEE Trans. On PAS.PAS -96, July/August, 1977, pp1219-1325.

22272E32B-POWERSYSTEMDYNAMICS**3104****1. SYNCHRONOUSMACHINEMODELLING****9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies: Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS**9**

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS**9**

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS**9**

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. P.Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol. PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

OBJECTIVES:

- To understand the concept of electrical vehicles and its operations
- To understand the need for energy storage in hybrid vehicles
- To provide knowledge about various possible energy storage technologies that can be used in electric vehicles

UNIT I	ELECTRICVEHICLESANDVEHICLEMECHANICS	9
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Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics

UNIT II	ARCHITECTURE OF EV'S AND POWER TRAIN COMPONENTS	9
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Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV)- Power train components and sizing, Gears, Clutches, Transmission and Brakes

UNIT III	CONTROL OF DC AND AC DRIVES	9
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DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor based vector control operation – Switched reluctance motor (SRM) drives

UNIT IV	BATTERY ENERGY STORAGE SYSTEM	9
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Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries

UNIT V	ALTERNATIVE ENERGY STORAGE SYSTEMS	9
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Fuel cell – Characteristics – Types – hydrogen Storage Systems and Fuel cell EV – Ultracapacitors

TOTAL: 45 PERIODS

OUTCOMES:

- Learners will understand the operation of Electric vehicles and various energy storage technologies for electrical vehicles

REFERENCES

- 1 Iqbal Hussain, "Electric and Hybrid Vehicles: Design Fundamentals, Second Edition" CRC Press, Taylor & Francis Group, Second Edition (2011).
- 2 Ali Emadi, Mehrdad Ehsani, John M. Miller, "Vehicular Electric Power Systems", Special Indian Edition, Marcel Dekker, Inc 2010.

OBJECTIVES:

- To provide fundamental knowledge on electromagnetic interference and electromagnetic compatibility.
- To study the important techniques to control EMI and EMC.
- To expose the knowledge on testing techniques as per Indian and international standards in EMI measurement.

UNIT I	INTRODUCTION	9
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Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation typical noise path-EMI predictions and modeling, Cross talk -Methods of eliminating interferences.

UNIT II	GROUNDING AND CABLING	9
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Cabling- types of cables, mechanism of EMI emission / coupling in cables -capacitive coupling inductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding- safety grounds - signal grounds- single point and multipoint ground systems hybrid grounds- functional ground layout -grounding of cable shields- -guard shields- isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding- Earth measurement Methods

UNIT III	BALANCING, FILTERING AND SHIELDING	9
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Power supply decoupling- decoupling filters- amplifier filtering -high frequency filtering- EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding - near and far fields shielding effectiveness - absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings - grounding of shields

UNIT IV	EMI THROUGH ELEMENTS AND CIRCUITS	9
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EMI through elements, RC and RL networks, delays and switches, non-linearities in circuits, passive intermodulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

UNIT V	ELECTROSTATIC DISCHARGE, STANDARDS AND TESTING TECHNIQUES	9
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Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipment's- standards - FCC requirements - EMI measurements - Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

TOTAL: 45 PERIODS

OUTCOMES:

- Recognize the sources of Conducted and radiated EMI in Power Electronic Converters and consumer appliances and suggest remedial measures to mitigate the problems
- Assess the insertion loss and design EMI filter to reduce the loss
- Design EMI filters, common-mode chokes and RC-snubber circuits measure to keep the interference within tolerable limits

REFERENCES

1. V.P.Kodali,“EngineeringElectromagneticCompatibility”,S.Chand,1996
2. HenryW.Ott,“Noisereductiontechniquesinelectronicssystem”,JohnWiley& Sons, 1989
3. BernhardKeiser,“PrinciplesofElectro-magneticCompatibility”,ArtechHouse, Inc. (685 canton street, Norwood, MA 020062 USA) 1987
4. Bridges,J.E.MilletaJ.andRicketts.L.W.,“EMPRadiationandProtective techniques”, John Wiley and sons, USA 1976
5. WilliamDuffG.,&DonaldWhiteR.J,“SeriesonElectromagneticInterference and Compatibility”, Vol.
6. WestonDavidA.,“ElectromagneticCompatibility,PrinciplesandApplications”, 1991.

ELECTIVES–V(semester-III)**22272E33A-POWERCONDITIONING****3104****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEARLOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENTANDANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartleytransform – The Walsh Transform – Wavelet Transform.

4. ANALYSISANDCONVENTIONALMITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWERQUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybridfilters –Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitiveloads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

$$L = 45T = 15P = 0C = 4$$

REFERENCES:

1. ArindamGhosh“PowerQualityEnhancementUsingCustomPowerDevices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T,“ElectricPowerQuality”,StarsinaCirclePublications,1994(2nd edition)
3. Dugan.R.C,“ElectricalPowerSystemQuality”,TMH,2008.
4. Arrillga.A.JandNevilleR.Watson,PowerSystemHarmonics,JohnWileysecond Edition,2003.
5. Derek A.Paice,“Powerelectronicconverterharmonics”,JohnWiley&sons,1999.

ELECTIVES–V(semester-III)

22272E33B–DEREGULATEDPOWERSYSTEM**3104****1. FUNDAMENTALSANDARCHITECTUREOFPOWERMARKETS 9**

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICALCHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effectof contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion –Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSIONNETWORKSANDSYSTEMSECURITYSERVICES9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – UniformPricing–ZonalPricing–LocationalMarginalPricing–CongestionPricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIANPOWERMARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector –Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. KankarBhattacharya,MathH.J.BollenandJaapE.Daalder,“OperationofRestructured Power Systems”, Kluwer Academic Publishers, 2001

2. LoiLeiLai,“PowersystemRestructuringandRegulation”,JohnWileysons, 2001.
3. Shahidehpour.MandAlomoush.M,“RestructuringElectricalPowerSystems”, Marcel Decker Inc., 2001.
4. StevenStoft,“PowerSystemEconomics”,Wiley–IEEEPress,2002
5. DanielS.KirschenandGoranStrbac,“FundamentalsofPowerSystemEconomics”, John Wiley& Sons Ltd., 2004.
6. ScholarlyTransaction PapersandUtilityweb sites

22272E33C	CONTROL SYSTEM DESIGN FOR POWER ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explore conceptual bridges between the fields of Control Systems and Power Electronics
- To study control theories and techniques relevant to the design of feedback controllers in Power Electronics.

UNIT I MODELLING OF DC-TO-DC POWER CONVERTERS 9

Modelling of Buck Converter, Boost Converter, Buck-Boost Converter, Cuk Converter, Sepic Converter, Zeta Converter, Quadratic Buck Converter, Double Buck-Boost Converter, Boost-Boost Converter General Mathematical Model for Power Electronics Devices.

UNIT II SLIDING MODE CONTROLLER DESIGN 9

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces, Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter, Buck-Boost Converter, Cuk Converter, Sepic Converter, Zeta Converter, Quadratic Buck Converter, Double Buck-Boost Converter, Boost-Boost Converter.

UNIT III APPROXIMATE LINEARIZATION CONTROLLER DESIGN 9

Linear Feedback Control, Pole Placement by Full State Feedback, Pole Placement Based on Observer Design, Reduced Order Observers, Generalized Proportional Integral Controllers, Passivity Based Control, Sliding Mode Control Implementation of Buck Converter, Boost Converter, Buck-Boost Converter.

UNIT IV NONLINEAR CONTROLLER DESIGN 9

Feedback Linearization, Isidori's Canonical Form, Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control, Full Order Observers, Reduced Order Observers.

UNIT V PREDICTIVE CONTROL OF POWER CONVERTERS 9

Basic Concepts, Theory, and Methods, Application of Predictive Control in Power Electronics, AC-DC-AC Converter System, Faults and Diagnosis Systems in Power Converters.

**TOTAL:45
PERIODS**

OUTCOMES:

- Ability to understand an overview on modern linear and nonlinear control strategies for power electronics devices
- Ability to model modern power electronic converters for industrial applications
- Ability to design appropriate controllers for modern power electronics devices.

REFERENCES

1. Hebertt Sira-Ramírez, Ramón Silva-Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer 2012
2. Mahesh Patil, Pankaj Rodey, "Control Systems for Power Electronics: A Practical Guide", Springer India, 2015.
3. Blaabjerg José Rodríguez, "Advanced and Intelligent Control in Power Electronics and Drives", Springer, 2014
4. Enrique Acha, Vassilios Agelidis, Olimpo Anaya, TJE Miller, "Power Electronic Control in Electrical Systems", Newnes, 2002
5. Marija D. Aranya Chakraborty, Marija, "Control and Optimization Methods for Electric Smart Grids", Springer, 2012.

22272E33D

PRINCIPLES OF EHV TRANSMISSION

LT PC
3003**OBJECTIVES:**

To impart knowledge on,

- Types of power transmission and configurations various parameters and voltage gradients of transmission line conductors.
- The design requirements of EHV AC and DC lines.

UNIT I INTRODUCTION 9

Standard transmission voltages-AC and DC – different line configurations- average values of line parameters – power handling capacity and line loss – cost of transmission lines and equipment – mechanical considerations in line performance.

UNIT II CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – effect of ground return.

UNIT III VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers- I²R loss and corona loss-RIV.

UNIT IV ELECTROSTATIC FIELD AND DESIGN OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields – electrostatic induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference, Design of EHV lines.

UNIT V HVDC LINES

Introduction- Reliability and failure issues-Design-tower, ROW, clearances, insulators, electrical and mechanical protection-Maintenance-Control and protection-D.C Electric field band Magnetic field -Regulations and guide lines-underground line design.

TOTAL:45 PERIODS**OUTCOMES:**

- Ability to model the transmission lines and estimate the voltage gradients and losses
- Ability to design EHV AC and DC transmission lines

REFERENCES

- 1 Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 2006.
- 2 Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., 2009.
- 3 Sunil S.Rao, "EHV-AC, HVDC Transmission & Distribution Engineering", Third Edition, Khanna Publishers, 2008.
- 4 William H. Bailey, Deborah E. Weil and James R. Stewart, "A Review on HVDC Power Transmission Environmental Issues", Oak Ridge National Laboratory.
- 5 J.C Molburg, J.A. Kavicky, and K.C. Picel, "A report on The design, Construction and operation of Long-distance High-Voltage Electricity Transmission Technologies" Argonne (National Laboratory) 2007.
- 6 "Power Engineer's Handbook", Revised and Enlarged 6th Edition, TNEB Engineers' Association, October 2002.

ELECTIVES-VI(semester-III)

22272E34A-SOFTWAREFORCONTROLSYSTEMDESIGN**3104****1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL**

Systems performance and specifications – Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method– Open loop inversion– Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.- simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines -simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta, "Modern Control Engineering", PHI, 1997.
5. Dorf and Bishop, "Modern control Engineering", Addison Wesley, 1998.

ELECTIVES–VI(semester-III)

22272E34B-INDUSTRIALPOWERSYSTEMANALYSISAND DESIGN

31

04

1. MOTORSTARTINGSTUDIES

9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWERFACTORCORRECTIONSTUDIES

9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-SustainedOvervoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONICANALYSIS

9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKERANALYSIS

9

SourcesofFlicker-FlickerAnalysis-FlickerCriteria-DataforFlickeranalysis-CaseStudy- Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUNDGRIDANALYSIS

9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

$$L = 45T = 15P = 0C = 4$$

REFERENCES

1. RamasamyNatarajan,"Computer-AidedPowerSystemAnalysis",MarcelDekker Inc., 2002.

22272E34CSOFTCOMPUTINGTECHNIQUES

LTPC

OBJECTIVES:**3003**

- To expose the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about FLC and NN toolbox

UNIT I INTRODUCTION AND ARTIFICIAL NEURAL NETWORKS 9

Introduction to intelligent systems- Soft computing techniques- Conventional Computing versus Swarm Computing - Classification of meta-heuristic techniques - Properties of Swarm intelligent Systems - Application domain - Discrete and continuous problems - Single objective and multi-objective problems -Neuron- Nerve structure and synapse- Artificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks- Mc Culloch Pitts neuron model- perceptron model- Adaline and Madaline- multilayer perception model- back propagation learning methods- effect of learning rule coefficient-back propagation algorithm- factors affecting back propagation training- applications.

UNIT II ARTIFICIAL NEURAL NETWORKS AND ASSOCIATIVE MEMORY 9

Counter propagation network- architecture- functioning & characteristics of counter Propagation network- Hopfield/ Recurrent network configuration - stability constraints associative memory and characteristics- limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture- classifications- Implementation and training - Associative Memory.

UNIT III FUZZY LOGIC SYSTEM 9

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control- Fuzzification inferencing and defuzzification-Fuzzy knowledge and rule bases- Fuzzy modeling and control schemes for nonlinear systems. Self organizing fuzzy logic control- Fuzzy logic control for nonlinear time delay system.

UNIT IV GENETIC ALGORITHM 9

Evolutionary programs – Genetic algorithms, genetic programming and evolutionary programming - Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators - Optimization problems using GA-discrete and continuous - Single objective and multi-objective problems - Procedures in evolutionary programming.

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN-Neuro fuzzy systems-ANFIS – Fuzzy Neuron-Optimization of membership function and rule base using Genetic

Algorithm -Introduction to Support Vector Machine - Evolutionary Programming-Particle Swarm Optimization - Case study – Familiarization of NN, FLC and ANFIS Tool Box.

TOTAL:45PERIODS

OUTCOMES:

- Will be able to know the basic ANN architectures, algorithms and their limitations.
- Also will be able to know the different operations on the fuzzy sets.
- Will be capable of developing ANN based models and control schemes for non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.
- Will be competent to use hybrid control schemes and P.S.O and support vector Regressive.

TEXT BOOKS:

1. Laurene V. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms And Applications", Pearson Education.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India, 2008.
3. Zimmermann H.J. "Fuzzy set theory and its Applications" Springer international edition, 2011.
4. David E. Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, 2009.
5. W.T. Miller, R.S. Sutton and P.J. Webrose, "Neural Networks for Control" MIT Press", 1996.
6. T. Ross, "Fuzzy Logic with Engineering Applications", Tata McGraw Hill, New Delhi, 1995.
7. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)", MIT Press, 2004.
8. Corinna Cortes and V. Vapnik, "Support-Vector Networks, Machine Learning" 1995.

**22272E34D
OBJECTIVES:**

RESTRUCTURED POWER SYSTEM

**LTPC
3003**

- To introduce the restructuring of power industry and market models.
- To impart knowledge on fundamental concepts of congestion management.
- To analyze the concepts of locational marginal pricing and financial transmission rights.
- To illustrate about various power sectors in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNIT II TRANSMISSION CONGESTION MANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing- Lossless DCOPF model for LMP calculation - Loss compensated DCOPF model for LMP calculation - ACOPF model for LMP calculation - Financial Transmission rights - Risk hedging functionality - Simultaneous feasibility test and revenue adequacy - FTR issuance process: FTR auction, FTR allocation - Treatment of revenue shortfall- Secondary trading of FTRs- Flow gate rights- FTR and market power - FTR and merchant transmission investment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service - Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

UNIT V REFORMS IN INDIAN POWER SECTOR 9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

TOTAL:45PERIODS

OUTCOMES:

- Learners will have knowledge on restructuring of power industry
- Learners will understand basics of congestion management
- Learners will attain knowledge about locational margin prices and financial transmission rights
- Learners will understand the significance ancillary services and pricing of transmission network
- Learners will have knowledge on the various power sectors in India

REFERENCES

- 1 Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, “Restructured electrical power systems: operation, trading and volatility” Pub., 2001.
- 2 Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Bollen, “Operation of restructured power systems”, Kluwer Academic Pub., 2001.
- 3 Paranjothi, S.R. , “Modern Power Systems” Paranjothi, S.R. , New Age International, 2017.
- 4 Sally Hunt, “Making competition work in electricity”, John Wiley and Sons Inc. 2002.
- 5 Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley & Sons, 2002.



**PONNAIYAH RAMAJAYAM INSTITUTE OF
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Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

**SCHOOL OF ENGINEERING AND
TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL &
ELECTRONICS ENGINEERING**

PROGRAM HANDBOOK

B.Tech PART TIME

[Regulation2022]

[for candidates admitted to B.Tech EEE program from
June2022 onwards]

COURSE STRUCTURE

B.TECH PT
EEE
R 2022

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

B. Tech (PT) EEE R 22
SEMESTER I

Sl. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S11P	Transforms and Partial Differential Equations	3	1	0	4
2	22153C12P	Control System	3	1	0	4
3	22153C13P	Circuit Theory	3	1	0	4
4	22153C14P	Electronic circuits	3	0	0	3
5	22153C15P	Electrical Machines-I	4	0	0	4
Total No of Credits						19

SEMESTER II

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S21P	Numerical Methods	3	1	0	4
2	22153C22P	Optimization Techniques	3	0	0	3
3	22153C23P	Electrical Machines-II	3	1	0	4
4	22153C24P	Digital Electronics	3	1	0	4
5	22153C25P	Transmission and Distribution	4	0	0	4
Total No of Credits						19

SEMESTER III

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S31CP	Probability and Statistics	3	1	0	4
2	22153C32P	Linear Integrated Circuits and Applications	3	1	0	4
3	22153C33P	Power Electronics	4	0	0	4
4	22153C34P	Measurements and Instrumentation	4	0	0	4
5	22153L35P	DC and AC Electrical Machines Laboratory	0	0	3	2
Total No of Credits						20

SEMESTER IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153C41P	Protection and switchgear	4	0	0	4
2	22153C42P	High Voltage DC Transmission	3	1	0	4
3	22153C43P	Solid State Drives	3	1	0	4
4	22153E44_P	Elective –I	4	0	0	4
5	22153L45P	Control and Instrumentation Laboratory	0	0	3	2
Total No of Credits						18

SEMESTER V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153C51P	Power System Analysis	3	1	0	4
2	22153C52P	Power Quality	3	1	0	4
3	22153C53P	Special Electrical Machines	4	0	0	4
4	22153E54_P	Elective –II	4	0	0	4
5	22153L55P	Power Electronics and Drives Lab	0	0	3	2
Total No of Credits						18

SEMESTER VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153C61P	Utilization of Electrical Energy	3	1	0	4
2	22153C62P	Solid State Relays	4	0	0	4
3	22153C63P	Power System Operation and Control	4	0	0	4
4	22153E64_P	Elective –III	4	0	0	4
5	22153L65P	Power Systems Lab	0	0	3	2
Total No of Credits						18

SEMESTER VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22160S71P	Total Quality Management	3	0	0	3
2	22153C72P	Electrical Machine Design	3	1	0	4
3	22153C73P	Power Plant Engineering	4	0	0	4
4	22153E74_P	Elective –IV	3	0	0	3
5	22153P75P	Project Work	0	0	12	6
Total No of Credits						20

LIST OF ELECTIVES

ELECTIVE –I (IV SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153E44AP	Circuit Theory	4	0	0	4
2	22153E44BP	Fuzzy Logic and its Applications	4	0	0	4
3	22153E44CP	Bio Medical Instrumentation	4	0	0	4
4	22153E44DP	Modeling and Simulation of Solar Energy Systems	4	0	0	4
5	22153E44EP	Non conventional energy system & Applications	4	0	0	4

ELECTIVE –II (V SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153E54AP	Environmental Science and Engineering	4	0	0	4
2	22153E54BP	Artificial Neural Networks	4	0	0	4
3	22153E54CP	VLSI Design	4	0	0	4
4	22153E54DP	Robotics	4	0	0	4
5	22153E54EP	LT & HT Distribution System	4	0	0	4

ELECTIVE –III (VI SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153E64AP	Principles of Management	4	0	0	4
2	22153E64BP	Micro Electro Mechanical Systems	4	0	0	4
3	22153E64CP	Integrated opto-Electronic Devices	4	0	0	4
4	22153E64DP	Computer Aided Design of Electrical Apparatus	4	0	0	4
5	22153E64EP	Advanced DC-AC Power conversion	4	0	0	4

ELECTIVE –IV (VII SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22153E74AP	Power system transients	3	0	0	3
2	22153E74BP	EHV AC and DC Transmission systems	3	0	0	3
3	22153E74CP	Fundamentals of Nanoscience	3	0	0	3
4	22153E74DP	Advanced Control systems	3	0	0	3
5	22153E74EP	Switched Mode Power supplies	3	0	0	3

HOD**DEAN****DEAN ACADEMIC AFFAIRS**

22148S11P-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

3 1 0 4

(Common to all)

SEMESTER-1

UNIT I FOURIER SERIES 9 + 3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9 + 3hrs

Fourier integral theorem (without proof) – Sine and Cosine transforms – Properties (without Proof) – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier transform, Sine and Cosine transform.

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3hrs

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z–transform- Sampling of signals –an introduction.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9 + 3hrs

Formation of pde –solution of standard type first order equation- Lagrange's linear equation – Linear partial differential equations of second order and higher order with Constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS 9 + 3hrs

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

Total no of hrs: 60hrs

COURSE OUTCOMES

- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS

1. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillen , New York ,2288.
2. Grewal, B.S., “Higher Engineering Mathematics”, Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., “Engineering Mathematics Volume III”, S. Chand & Company ltd., New Delhi, 1996.

REFERENCE BOOKS

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramanaiah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
3. Advanced Modern Engineering mathematics – Glyn James

22153C12P- CONTROL SYSTEM

3 1 0 4
SEMESTER-1

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

- i. To understand the methods of representation of systems and getting their transfer function models.
- ii. To provide adequate knowledge in the time response of systems and steady state error analysis.
- iii. To give basic knowledge is obtaining the open loop and closed-loop frequency responses of systems.
- iv. To understand the concept of stability of control system and methods of stability analysis.
- v. To study the three ways of designing compensation for a control system.

UNIT I: INTRODUCTION

12

Open-loop and closed –loop systems, servomechanisms and regulator systems; Transfer function; Block diagram reduction, Signal flow graphs.

UNIT II: MATHEMATICAL MODELS OF PHYSICAL SYSTEMS

12

Mechanical systems - Translational and Rotational systems, Gear trains, Electrical systems, Thermal systems and Fluid systems.

Components of feedback control systems - Potentiometers as error sensing devices, Synch, Servomotors, Stepper motors, Tachogenerators.

UNIT III: STABILITY

12

Concept of Stability, necessary and sufficient conditions of Stability, Closed-loop systems, merits and demerits, Routh-Hurwitz Criterion.

Transient Response: Typical inputs, convolution integral, Time domain specifications, steady state errors.

State equation – Solutions – Realization – Controllability – Observability – Stability

Jury's test.

UNIT IV: FREQUENCY RESPONSE

12

Definition, equivalence between transient response and frequency response, Bode plots.

Nyquist Stability Criterion: Development of criterion, gain and phase margins, m- circles and Nichol's chart.

UNIT V: ROOT LOCUS METHOD

12

Rules for sketching of root loci, Root contours.

Synthesis: Lag and Lead networks, proportional, derivative and integral controllers.

MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

Total = 60

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of
- Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOK:

1. I.J.Nagrath and M.Gopal, 'Control System Engineering', Wiley Eastern Ltd., Reprint 1995.

REFERENCES:

1. M.Gopal, 'Control System Principles and Design', Tata McGraw Hill, 1998.
2. Ogatta, 'Modern Control Engineering', Tata McGraw Hill 1997.

22153C13P- CIRCUIT THEORY

3 1 0 3
SEMESTER-1

AIM

To know about basic analysis and synthesis techniques used in electronics and communications.

OBJECTIVES

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To Phasor diagrams and analysis of three phase circuits

UNIT-I BASIC CIRCUITS ANALYSIS (9)

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.

UNIT-II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS (9)

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem..

UNIT-III RESONANCE AND COUPLED CIRCUITS (9)

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self andmutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT-IV TRANSIENT RESPONSE FOR DC CIRCUITS (9hrs)

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

UNIT-V THREE PHASE CIRCUITS (9hrs)

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL 45

COURSE OUTCOMES

- Ability analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse AC and DC Circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s series, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES:

1. Paranjothi SR, “Electric Circuits Analysis,” New Age International Ltd., New Delhi, 1996.
2. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Tata McGraw Hill, 2007.
3. Chakrabati A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
4. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2003.

22153C14P - **ELECTRONIC CIRCUITS**

3 0 0 3
SEMESTER-1

AIM:

To study the characteristics and applications of electronic devices.

OBJECTIVES:

- To acquaint the students with construction, theory and characteristics of the following electronic devices:
- Bipolar transistor, Field Effect transistor, Multivibrators, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I -RECTIFIER & POWER SUPPLY 12

Half & Full wave rectifier – filters – shunt , inductor, LC section & Ripple factor, P calculation for C, L and LC filters – Voltage regulators – Zener –Series voltage regulator – SMPS.

UNIT II- AMPLIFIERS 12

Amplifiers – Frequency response of RC coupled - Frequency Response of Emitter follower, gain band width product – FET amplifier at low and high frequency cascaded amplifiers.

UNIT III- FEEDBACK AMPLIFIER & OSCILLATORS 12

Four basic types of feedback – effect of feedback on amplifier performance – condition for oscillation – Barkhunsen criteria – LC oscillators – Hartley & Colpitts – RC oscillators – Wein bridge, RC phase shift crystal oscillator.

UNIT IV- MULTIVIBRATORS 12

Collector coupled & Emitter coupled Astable multivibrator – Monostable, Bistable multivibrator – triggering methods – Storage delay and calculation of switching time – Schmitt triggering circuits – Speed up capacitor in switching.

UNIT V- POWER AMPLIFIER 12

Classification – class A, B, C & AB – Class B push pull – Class B Complimentary – symmetry – Class S, Power sections classification – Efficiency – Distortion in amplifiers.

L = 45 T = 15 P = 0 TOTAL =60

COURSE OUTCOMES

- Upon Completion of the course, the students will be able to:
- Explain the structure and working operation of basic electronic devices.
- Able to identify and differentiate both active and passive elements
- Analyze the characteristics of different electronic devices such as diodes and transistors
- Choose and adapt the required components to construct an amplifier circuit. Employ the acquired knowledge in design and analysis of oscillators

REFERENCE BOOKS:

1. David.A.Bell, "Solid State Pulse Circuits", Prentice Hall of India, 4th Edition, 2001.
2. Millman Taub.H, "Pulse Digital & Switching waveform", Tata McGRaw Hill International 2001.
3. Jacob Millman Cristas C.Halkias, "Integrated Electronics", Tat Mc Graw Hill, Edition 1991.

22153C15P- ELECTRICAL MACHINES – I**4 0 0 4****AIM****SEMESTER-1**

To expose the students to the concepts of electromechanical energy conversions in D.C. Machines and energy transfer in transformers and to analyze their performance.

OBJECTIVES

- i. To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.
- ii. To understand the generation of D.C. voltages by using different type of generators and study their performance.
- iii. To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.
- iv. To familiarize with the constructional details of different type of transformers, working principle and their performance.
- v. To estimate the various losses taking place in D.C. machines and transformers and to study the different testing method to arrive at their performance.

UNIT I: BASIC PRINCIPLES OF ROTATING MACHINES**12**

Electrical machine types – Magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits - core losses. Principles of Electromechanical energy conversion: Energy conversion process – Energy in magnetic system – Field energy and mechanical force – Multiply excited magnetic field systems

UNIT II: GENERATORS**12**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNIT III: DC MOTORS**12**

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

UNIT IV: TRANSFORMERS**12**

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio - Equivalent circuit – Losses – Testing – Efficiency and Voltage regulation . Transformer on load– Parallel operation of single phase transformers – Auto transformer – Three phase transformers

UNIT V: TESTING OF TRANSFORMERS AND DC MACHINES**12**

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

TOTAL = 60

COURSE OUTCOMES

- Ability to analyze the magnetic-circuits.
- Ability to acquire the knowledge in constructional details of transformers. Ability to understand the concepts of electromechanical energy conversion. Ability to acquire the knowledge in working principles of DC Generator.
- Ability to acquire the knowledge in working principles of DC Motor
- Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J .B.Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.
4. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and Company Ltd, third edition, 2003.

22148S21P-**NUMERICAL METHODS**

3 1 0 4
Semester II

UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3hrs

Solution of equations–Newton Raphson’s method, Regula-falsi methods Solution of linear System of equations by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods– Eigenvalue of a matrix by power method.

UNIT II- INTERPOLATION

9+3hrs

Newton’s forward and backward difference formulas – Central difference formula: Bessels and Stirling’s formula - Lagrangian Polynomials – Divided difference method.

UNIT III- NUMERICAL DIFFERENTIATION AND INTEGRATION

9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Double integrals using trapezoidal and Simpson’s rules.

UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9+3hrs

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne’s and Adam’s predictor and corrector methods.

UNIT V - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

9+3hrs

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total no of hrs: 60hrs

COURSE OUTCOMES

- Understand the basic concepts and techniques of solving algebraic equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, “Applied Numerical Analysis”, Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., “Numerical Methods”, S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES BOOKS

1. Burden, R.L and Faires, T.D., “Numerical Analysis”, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., “Numerical Methods”, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

22153C22P - OPTIMISATION TECHNIQUES

3 0 0 3
SEMESTER II

AIM:

To understand the architecture of different optimization techniques and its applications

OBJECTIVES:

To provide a clear understanding of

- To introduce the basic concepts of linear programming
- To educate on the advancements in Linear programming techniques
- To introduce non-linear programming techniques
- To introduce the interior point methods of solving problems
- To introduce the dynamic programming method

UNIT I LINEAR PROGRAMMING 9

Introduction - formulation of linear programming model-Graphical solution-solving LPP using simplex algorithm – Revised Simplex Method

UNIT II ADVANCES IN LPP 9

Dualit theory- Dual simplex method - Sensitivity analysis--Transportation problems- Assignment problems-Traveling sales man problem -Data Envelopment Analysis..

UNIT III NON LINEAR PROGRAMMING 9

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT IV INTERIOR POINT METHODS 9

Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm.

UNIT V DYNAMIC PROGRAMMING 9

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming– Backward and Forward recursion– Computational procedure–Conversion of final value problem in to Initial value problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- To understand ethical issues, environmental impact and acquire management skills.

TEXT BOOKS:

1. Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000.
2. R.Panneerselvam, “Operations Research”, PHI, 2006.
3. Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

REFERENCES:

1. Philips, Ravindran and Solberg, "Operations Research", John Wiley, 2002.
2. Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd. New Delhi, 2005.

Semester II

22153C23P-ELECTRICAL MACHINES-II**3 1 0 4****AIM:**

To expose the students to the concepts of synchronous and asynchronous machines and analyze their performance.

OBJECTIVES:

To impart knowledge on

- i. Construction and performance of salient and non – salient type synchronous generators.
- ii. Principle of operation and performance of synchronous motor.
- iii. Construction, principle of operation and performance of induction machines.
- iv. Starting and speed control of three-phase induction motors.
- v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I: SYNCHRONOUS GENERATOR**12**

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

UNIT II: SYNCHRONOUS MOTOR**12**

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

UNIT III: THREE PHASE INDUCTION MOTOR**12**

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors

UNIT IV: STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**12**

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

UNIT V: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINE**12**

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test — Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

Total = 60

COURSE OUTCOMES

Ability to understand the construction and working principle of Synchronous Generator

- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.*REFERENCE BOOKS*

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.

22153C24P-DIGITAL ELECTRONICS

3 1 0 4

AIM:

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES:

- i. To study various number systems and to simplify the mathematical expressions using Boolean functions simple problems.
- ii. To study implementation of combinational circuits
- iii. To study the design of various synchronous and asynchronous circuits.
- iv. To expose the students to various memory devices.

UNIT I NUMBER SYSTEMS

12

Review of Binary, Octal and Hexa-decimal number systems – Conversions, Binary Arithmetic magnitude form – 1's, 2's complement representation, Codes: -BCD, Excess – 3, Graycode, ASCII codes, Error detecting codes (Hamming code)

UNIT II BOOLEAN ALGEBRA

12

Boolean Algebra - De Morgan's law – Simplifications of Boolean expression – sum of Products and product of sums – Karnaugh Map – Quince McClusky method of simplification (Including Don't care conditions)

UNIT III Combinational Logic

12

Design of Logic gates- Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT IV Sequential Logic Design

12

Building blocks of Sequential logic – RS, JK, Master – Slave, D and T flip- flop, Asynchronous and synchronous counters – Binary and BCD counters – shift registers – Design and Implementation of Sequential synchronous circuits

UNIT V Logic Families

12

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TOTAL = 60Hrs

COURSE OUTCOMES

- Ability to design combinational and sequential Circuits.
- Ability to simulate using software package.
- Ability to study various number systems and simplify the logical expressions using
- Boolean functions
- Ability to design various synchronous and asynchronous circuits.
- Ability to introduce asynchronous sequential circuits and PLDs
- Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOK:

1. Albert Paul, Malvino and Donald.P.Leach , “Digital Principles and Applications”, McGraw Hill Publications.
2. Floyd, “Digital Fundamentals”, Universal Book Stall, New Delhi,1993.
3. Moris Mano, “Digital Electronics and Design “, Prentice Hall of India, 2000.

REFERENCE:

1. “Digital Logic & Computer Design”, Prentice Hall of India, 2000.

22153C25P-TRANSMISSION AND DISTRIBUTION

4 0 0 4

Semester II

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

- i. To develop expression for computation of fundamental parameters of lines.
- ii. To categorize the lines into different classes and develop equivalent circuits for these classes.
- iii. To analyze the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I: INTRODUCTION

12

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability.

Radial and ring-main distributors; interconnections; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

UNIT II: TRANSMISSION LINE PARAMETERS

12

Resistance, Inductance and Capacitance of single and three phase transmission lines - Stranded and Bundled conductors - Symmetrical and unsymmetrical spacing - Transposition - Application of self and mutual GMD - Skin and Proximity effect - Inductive interference with neighboring circuits.

UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES

12

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV: INSULATORS AND CABLES

12

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V: DESIGN OF TRANSMISSION LINES

12

Introduction, calculation of sag and tension .Equivalent span length and sag, Effect of ice and wind loading ,Stringing chart, sag template, conductor vibrations and vibrations dampers

TOTAL =60

COURSE OUTCOMES

To understand the importance and the functioning of transmission line parameters.

- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To acquire knowledge on Underground Cabilitys

TEXT BOOKS

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCE BOOKS

1. Luces M.Fualkenberry ,Walter Coffe, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

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22148S31CP - PROBABILITY AND STATISTICS**3 1 0 4****(Common to Mech, Civil, EEE)****SEMESTER-III****UNIT I PROBABILITY AND RANDOM VARIABLE 9+3hrs**

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties - Moments - Moment generating functions and their properties.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3hrs

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT III STANDARD DISTRIBUTIONS 9+3hrs

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

UNIT IV TESTING OF HYPOTHESIS 9+3hrs

Sampling distributions - Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS 9+3hrs

Analysis of variance - One way classification - Complete randomized design - Two - way classification - Randomized block design - Latin square.

Note : Use of approved statistical table permitted in

Total no of hrs: 60hrs**COURSE OUTCOMES**

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and

Green's theorems and their verification.

- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients

TEXT BOOKS

1. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES BOOKS

- 1) Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
- 2) Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics", McGraw-Hill, New Delhi, 1998.
- 3) Gupta, S.C, and Kapur, J.N., "Fundamentals of Mathematical Statistics", Sultan Chand, Ninth Edition , New Delhi ,1996.

22153C32P- **LINEAR INTEGRATED CIRCUITS AND APPLICATIONS**

3 1 0 4

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like circuits, regulator Circuits, ADCs.

UNIT I: IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT II: CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics,, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters ,summer, differentiator and integrator.

UNIT III: APPLICATIONS OF OPAMP 9

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNIT IV: SPECIAL ICs 9

Functional block, characteristics & application circuits with 555 Timer Ic-566 voltage controlled oscillator Ic; 565-phase lock loop Ic ,Analog multiplier ICs.

UNIT V: APPLICATION ICs

IC voltage regulators –LM78XX,79XX Fixed voltage regulators - LM317, 723 Variable voltage regulators, switching regulator- SMPS- LM 380 power amplifier- ICL 8038 function generator IC.

TOTAL = 45

COURSE OUTCOMES

- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS

1. David A.Bell, ‘Op-amp & Linear ICs’, Oxford, 2013.
2. D.Roy Choudhary, Sheil B.Jani, ‘Linear Integrated Circuits’, II edition, New Age, 2003.
3. Ramakant A.Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCE BOOKS

1. Fiore,”Opamps & Linear Integrated Circuits Concepts & Applications”,Cengage,2010.
2. Floyd ,Buchla,”Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, ‘Integrated Electronics - Analog and Digital circuits system’,Tata McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, ‘Op-amp and Linear ICs’, PHI Learning, 6th edition,2012.

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22153C33P - POWER ELECTRONICS**4 0 0 4****AIM:**

To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

OBJECTIVES:

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.

UNIT I- POWER SEMI-CONDUCTOR DEVICES :

12

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, GBT, MOSFET – Computer simulation of PE circuits.

UNIT II-PHASE CONTROLLED CONVERTERS

12

2 pulse / 3 pulse and 6 pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters.

UNIT III -DC TO DC CONVERTERS

12

Stepdown and stepup chopper – Forced commutation techniques – Time ratio control and current limit control – Switching mode regulators Buck, Boost, Buck-Boost – concept of resonant switching.

UNIT IV- INVERTERS

12

Single phase and three phase [120° & 180° mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM – Voltage and harmonic control – Series resonant inverter – current source inverter.

UNIT V- AC TO AC CONVERTERS

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverters – power factor control – Matrix converters.

L: 45 T: 15 TOTAL: 60 PERIODS

COURSE OUTCOMES

- Ability to analyse AC-AC and DC-DC and DC-AC converters.
- Ability to choose the converters for real time applications.

TEXT BOOKS:

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

22153C34P-MEASUREMENTS AND INSTRUMENTATION

4 0 0 4

Semester III

AIM

To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.

- i. Introduction to general instrument system, error, calibration etc.
- ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- iii. To have an adequate knowledge of comparison methods of measurement.
- iv. Elaborate discussion about storage & display devices.
- v. Exposure to various transducers and data acquisition system.

UNIT I: INTRODUCTION 10

Functional elements of an Instrument -Static and Dynamic characteristics -Errors in measurement -Statistical evaluation of measurement data -Standard and Calibration.

UNIT II: ELECTRICAL AND ELECTRONICS INSTRUMENTS 12

Construction and principle of operation of moving coil, moving Iron, Principle and types analog and digital ammeters and voltmeters -Single and three phase Wattmeter and Energy meter - magnetic measurements - -Instruments for measurement of frequency and phase.

UNIT III: SIGNAL CONDITIONING CIRCUITS 12

Bridge circuits – Differential and Instrumentation amplifiers -Filter circuits - V/f and f/V converters – P/I and I/P converters – S/H Circuit, A/D and D/A converters -Multiplexing and De-multiplexing -Data acquisition systems –Grounding techniques.

UNIT IV: STORAGE AND DISPLAY DEVICES 12

Magnetic disc and Tape Recorders -Digital plotters and printers -CRT displays -Digital CRO – LED, LCD and Dot matrix displays.

UNIT V: TRANSDUCERS 14

Classification of Transducers -Selection of Transducers –Resistive, Capacitive and Inductive Transducers -Piezo electric Transducers -Transducers for measurement of

displacement, temperature, level, flows, pressure, velocity, acceleration, torque, speed, viscosity and moisture.

Total = 60

COURSE OUTCOMES

To acquire knowledge on Basic functional elements of instrumentation

- To understand the concepts of Fundamentals of electrical and electronic instruments
- Ability to compare between various measurement techniques
- To acquire knowledge on Various storage and display devices
- To understand the concepts Various transducers and the data acquisition systems
- Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

TEXT BOOKS

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2003.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 1995.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.

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**22153L35P- DC AND AC ELECTRICAL MACHINES
LABORATORY**

0 0 3 2

Semester III

OBJECTIVES:

- To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.
- To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

LIST OF EXPERIMENTS

1. Open circuit characteristics of D.C. shunt generator.
2. Load characteristics of D.C. shunt generator.
3. Load test on D.C. shunt and Compound Motor.
4. Load test on D.C. series motor.
5. Swinburne's test and speed control of D.C. shunt motor
6. Hopkinson's test on D.C. motor generation set.
7. Load test on single phase and three phase transformer
8. open circuit and short circuit tests on single phase and three phase transformer (Determination of equivalent circuit parameters).
9. Load test on single phase induction motor.
10. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
11. Load test on Three phase induction motor.
12. Study of Starters **TOTAL: 45**

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to conduct performance tests on DC and AC machines
- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. Single Phase Transformer – 4 nos
3. DC Series Motor with Loading Arrangement – 1 No.

4. Three Phase Induction Motor with Loading Arrangement – 2 nos
5. Single Phase Induction Motor with Loading Arrangement – 1 No
6. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
7. DC Shunt Motor Coupled With DC Shunt Generator – 1 No.
8. Tachometer -Digital/Analog – 8 nos
9. Single Phase Auto Transformer – 2 nos
10. Three Phase Auto Transformer – 1 No.
11. Single Phase Resistive Loading Bank – 2 nos
12. Three Phase Resistive Loading Bank. – 2 nos
13. SPST switch – 2 nos
14. Single Phase Transformer - 1 No.
15. Three Phase Transformer - 1 No.

22153C41P- PROTECTION AND SWITCHGEAR**4 0 0 4****AIM**

To expose the students to the various faults in power system and learn the various methods of protection scheme.

To understand the current interruption in Power System and study the various switchgears.

OBJECTIVES

- i. Discussion on various earthing practices usage of symmetrical components to estimate fault current and fault MVA.
- ii. Study of Relays & Study of protection scheme, solid state relays.
- iii. To understand instrument transformer and accuracy.
- iv. To understand the method of circuit breaking various arc theories Arcing phenomena – capacitive and inductive breaking.
- v. Types of circuit breakers.

UNIT I: INTRODUCTION**12**

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNIT II: OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS**12**

Need for protection – essential qualities of protective relays – Electromagnetic relays, Induction relays – Over current relays - Directional, Distance, Differential and negative sequence relays. Static relays

UNIT III: APPARATUS PROTECTION**12**

Apparatus protection transformer, generator, motor, protection of bus bars, transmission lines – CTs and PTs and their applications in protection schemes.

UNIT IV: THEORY OF CIRCUIT INTERRUPTION**12**

Physics of arc phenomena and arc interruption. Restricting voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNIT V: CIRCUIT BREAKERS**12**

Types of Circuit Breakers – Air blast, Air break, oil SF₆ and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers

COURSE OUTCOMES

- Ability to understand and analyze Electromagnetic and Static Relays.
- Ability to suggest suitability circuit breaker.
- Ability to find the causes of abnormal operating conditions of the apparatus and system.
- Ability to analyze the characteristics and functions of relays and protection schemes. Ability to study about the apparatus protection, static and numerical relays.
- Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

REFERENCE BOOKS

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2001.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

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22153C42P -HIGH VOLTAGE DC TRANSMISSION

3 1 0 4

Semester IV

AIM:

To learn the HVDC modelling and control strategy.

OBJECTIVES:

- To study the performance of converters and modeling of DC line with controllers.
- To study about converter harmonics and its mitigation using active and passive filters.

UNIT I- DC POWER TRANSMISSION TECHNOLOGY 9

Introduction-comparison of AC and DC transmission application of DC transmission – Description of DC transmission system planning for HVDC transmission-modern trends In DC transmission.

UNIT II- ANALYSIS OF HVDC CONVERTERS 9

Pulse number, choice of converter configuration-simplified analysis of Graetz circuit converter bridge characteristics – characteristics of a twelve pulse converter-detailed analysis of converters.

UNIT III- CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control-converter control characteristics-system control Hierarchy-firing angle control-current and extinction angle control-starting and stopping of DC link-power control-higher level controllers-telecommunication requirements.

UNIT IV -HARMONICS AND FILTERS 9

Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency and RI noise.

UNIT V -SIMULATION OF HVDC SYSTEMS 9

Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system. Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. Padiyar, K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi 1990. First edition.
2. P.Kundur, 'Power System Stability and Control', Tata McGraw Hill Publishing Company Ltd., USA, 1994.
3. Arrillaga, J., High Voltage direct current transmission, Peter Pregrinus, London, 1983.

REFERENCES:

1. Edward Wilson Kimbark, Direct Current Transmission, Vol. I, Wiley interscience, New York, London, Sydney, 1971.
2. Rakosh Das Begamudre, Extra high voltage AC transmission engineering New

22153C43P- **SOLID STATE DRIVES**

3 1 0 4

Semester IV

AIM

To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

- i. To understand the stable steady-state operation and transient dynamics of a motor-load system.
- ii. To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
- iii. To study and understand the operation of both classical and modern induction motor drives.
- iv. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- v. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive.

UNIT I DRIVE CHARACTERISTICS

9

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II DC MOTOR DRIVE

9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III STATOR CONTROLLED INDUCTION MOTOR DRIVES

9

Variable terminal voltage control – Variable frequency control – V/f control - AC voltage controllers – Four-quadrant control and closed loop operation - Frequency controlled drives- VSI and CSI fed drives – closed loop control.

UNIT IV ROTOR CONTROLLED INDUCTION MOTOR DRIVES

9

Rotor resistance control – slip power recovery schemes - sub synchronous and super synchronous operations – closed loop control – Braking in induction motors.

UNIT V- SYNCHRONOUS MOTOR DRIVES

9

Wound field cylindrical rotor motor – operation from constant voltage and frequency source – operation from current source – operation from constant frequency – Brushless excitation – Permanent magnet synchronous motor.

Self-controlled Synchronous motor drives – Brushless dc and ac motor drives – CSI with load commutation – Cycloconverter with load commutation.

TOTAL = 45

COURSE OUTCOMES

- Ability to understand and suggest a converter for solid state drive.
- Ability to select suitability drive for the given application.
- Ability to study about the steady state operation and transient dynamics of a motor load system. Ability to analyze the operation of the converter/chopper fed dc drive.
- Ability to analyze the operation and performance of AC motor drives.
- Ability to analyze and design the current and speed controllers for a closed loop solid

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.
2. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

REFERENCE BOOKS

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.
2. Vedam Subrahmanyam, "Electric drives concepts and applications", TMH Pub. Co.Ltd., 1994.
3. Murphy, J.M.D and Turnbull.F.G. , "Thyristor control of AC Motors", Pergamon Press, 1988.
4. Sen. P.C., "Thyristor D.C. Drives", John Wiley and Sons, 1981.

AIM

To provide knowledge on analysis and design of control and instrumentation

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges
9. Dynamics of Sensors/Transducers
 - a. Temperature
 - b. Pressure
 - c. Displacement
 - d. Optical
 - e. Strain f. Flow
10. Power and Energy Measurement
11. Signal Conditioning
 - a. Instrumentation Amplifier
 - b. Analog – Digital and Digital –Analog converters (ADC and DACs)
12. Process Simulation.

P = 45**Total = 45****COURSE OUTCOMES**

Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID kit – 1 No.
- DSO – 1 No.
CRO Probe – 2 nos
Personal computers
3. DC motor – 1 No.
- Generator – 1 No. Rheostats – 2 nos
Ammeters Voltmeters

Connecting wires (3/20)

4. CRO 30MHz – 1 No.

2MHz Function Generator – 1No.

5. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set

6. AC Synchro transmitter & receiver – 1No.

Digital multi meters

INSTRUMENTATION:

7. R, L, C Bridge kit (with manual)

8. a) Electric heater – 1No.

Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.

b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA)

Air foot pump – 1 No. (with necessary connecting tubes)

c) LVDT 20mm core length movable type – 1No. CRO 30MHz – 1No.

d) Optical sensor – 1 No. Light source

e) Strain Gauge Kit with Handy lever beam – 1No.

100gm weights – 10 nos

f) Flow measurement Trainer kit – 1 No.

(1/2 HP Motor, Water tank, Digital Milliammeter, complete set)

9. Single phase Auto transformer – 1No.

Watt hour meter (energy meter) – 1No. Ammeter

Voltmeter Rheostat Stop watch

Connecting wires (3/20)

10. IC Transistor kit – 1No.

22153C51P-POWER SYSTEM ANALYSIS

3 1 0 4
Semester V

AIM

To become familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

OBJECTIVES

- i. To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
- ii. To model and analyse power systems under abnormal (fault) conditions.
- iii. To model and analyse the dynamics of power system for small-signal and large signal disturbances and to design the systems for enhancing stability.

UNIT I- THE POWER SYSTEM AN OVER VIEW AND MODELLING 12

Modern Power System - Basic Components of a power system - Per Phase Analysis
Generator model - Transformer model - line model. The per unit system -Change of base.

UNIT II- POWER FLOW ANALYSIS 12

Introduction - Bus Classification - Bus admittance matrix - Solution of non-linear Algebraic equations - Gauss seidal method - Newton raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III-FAULT ANALYSIS-BALANCED FAULT 12

Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of the bus impedance matrix.

UNIT IV-FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND UNBALANCED FAULT 12

Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V-POWER SYSTEM STABILITY 12

Dynamics of a Synchronous machine – Swing equation and Power angle equation – Steady state Stability and Transient state Stability - Equal area criterion – Clearing angle and time- Numerical solution of Swing equation for single machine

Total = 60 Hrs

COURSE OUTCOMES

- Ability to model the power system under steady state operating condition
 - Ability to understand and apply iterative techniques for power flow analysis
 - Ability to model and carry out short circuit studies on power system
- Ability to model and analyze stability problems in power system

- Ability to acquire knowledge on Fault analysis.
- Ability to model and understand various power system components and carry out power flow, short circuit and stability studies

TEXT BOOKS:

1. Hadi Saadat “Power system analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, “Power System Stability and Control”, Tata McGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCE BOOKS:

1. I.J.Nagrath and D.P.Kothari, ‘Modern Power System Analysis’, Tata McGraw-Hill publishing company, New Delhi, 1990.
2. M.A. Pai, ‘Computer Techniques in power system Analysis’, Tata McGraw – Hill publishing company, New Delhi, 2003.
3. John J. Grainger and Stevenson Jr. W.D., ‘Power System Analysis’, McGraw Hill International Edition, 1994

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UNIT I INTRODUCTION TO POWER QUALITY 3

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES 10

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables.

UNIT IV HARMONICS 12

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 17

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic/spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L=45 Total=45**COURSE OUTCOMES**

- Ability to understand and analyze power system operation, stability, control and protection.
- The students able to understand the over voltage protection & analysis tools used for analyzing the transients.
- They are fully trained in designing and evaluating the devices of harmonic distortion.

REFERENCE BOOKS

1. Roger.C.Dugan, Mark.F.McGranaghram, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCAD User Manual.

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of synchronous reluctance motors.
- ii. Construction, principle of operation and performance of stepping motors.
- iii. Construction, principle of operation and performance of switched reluctance motors.
- iv. Construction, principle of operation and performance of permanent magnet brushless D.C. motors.
- v. Construction, principle of operation and performance of permanent magnet synchronous motors.

UNIT I-SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.

UNIT II -STEPPING MOTORS 9

Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits.

UNIT III-SWITCHED RELUCTANCE MOTORS 9

Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control - characteristics – computer control.

UNIT IV-PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

UNIT V-PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

L=45 Total=45**COURSE OUTCOMES**

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.

- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.

TEXT BOOKS

1. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 2289.
2. Aearnley, P.P., 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCES

1. Kenjo, T., 'Stepping Motors and their Microprocessor Controls', Clarendon Press London, 1984.
2. Kenjo, T., and Nagamori, S., 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.

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AIM

To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

1. Study Of V-I Characteristics Of An SCR.
2. Study Of V-I Characteristics Of A TRIAC.
3. Study Of Different Trigerring Circuits For Thyristor.
4. Study Of Uni- Junction Transistor (UJT) Trigerring Circuit.
5. Study Of A Firing Circuit Suitable For Single Phase Half Controlled Convertor.
6. Simulation On the Single Phase Ac-Dc Uncontrolled Convertor with & without the source Inductance.
7. Simulation Of A Single Phase Ac To Controlled Dc Convertor with & without the source Inductance.
8. Single Phase Half Controlled Bridge Convertor With Two Thyristors & Two Diodes.
9. Single Phase Fully Controlled Bridge Convertor Using Four Thyristors.
10. Pspice or MATH LAB Simulation Of Dc to Dc Step Down Chopper.
11. Pspice or MATH LAB Simulation Of Single Phase Controller with R-L Load.
12. Pspice or MATH LAB Simulation Of PWM Bridge Invertor Of R-L Load Using MOSFET.

COURSE OUTCOMES

- Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- Ability to analyze about AC to DC converter circuits.
- Ability to analyze about DC to AC circuits.
- Ability to acquire knowledge on AC to AC converters
- Ability to acquire knowledge on simulation software.

AIM

To plan and design using basic principles and handbooks

To select equipment, processes and components in different situations.

OBJECTIVES

i. To ensure that the knowledge acquired is applied in various fields as per his job requirements.

ii. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize with the new developments in different areas.

UNIT I ELECTRIC LIGHTING 12

Production of light – Definition of terms – Lighting calculations – Types of lamps – Interior and Exterior illumination systems – Lighting schemes – Design of Lighting schemes – Factory lighting – Flood lighting – Energy saving measures.

UNIT II ELECTRIC HEATING 12

Resistance heating – Induction heating – Dielectric heating – Arc furnace – Control equipment, efficiency, and losses – Energy conservation in Arc Furnace Industry.

UNIT III ELECTRIC WELDING 12

Welding equipment – Characteristics of carbon and metallic arc welding – Butt welding – Spot welding – Energy conservation in welding.

UNIT IV ELECTRIC VEHICLE 12

Traction: System of track electrification, train movement and energy consumption (speed time curves, crest speed, average speed and schedule speed) rective effort, factors affecting energy consumption (dead weight, acceleration weight and adhesion weight) starting and braking of traction motors, protective devices

UNIT V ELECTRO CHEMICAL PROCESS 12

Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, efficiency – Batteries – Types – Charging methods.

Total = 60

COURSE OUTCOMES

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

Text Books:

1. Tripathy,S.C., “Electric Energy Utilization & Conservation” – Tata McGraw Hill Publishing Company.
2. Uppal,S.L., “Electric Power”, Khanna Publishers.
3. Soni,M.L., P.V.Gupta & Bhatnagar , “A course in Electric Power”, Dhanpat Rai & Sons.

Reference Books:

1. Partab,H., “Art & Science Utilization of Electrical Energy” – Dhanpat Rai & Sons.
2. Wadhwa,C.L., “Generation, Utilization & Distribution” - Wilsey Eastern Ltd.
3. Wadha C L - Utilization of Electric Power; New Age International
4. Suryanarayana . N.V., “Utilization of Electric Power” - Wilsey Eastern Ltd.

UNIT 1	9
Advantages of Static Relays – Generalized Characteristics and Operational Equations of Relays – Steady State and Transient Performance of Signal Driving Elements – Signal Mixing Techniques and Measuring Techniques – CT's and PT's in Relaying Schemes – Saturation Effects.	
UNIT 2	9
Static Relay Circuits (Using Analog and Digital IC's) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.	
UNIT 3	9
Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.	
UNIT 4	9
Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.	
UNIT 5	9
Microprocessor Based Relays – Hardware and Software for the Measurement of Voltage, Current, Frequency, Phase Angle – Microprocessor Implementation of Over Current Relays – Inverse Time Characteristics – Impedance Relay – Directional Relay – MHO Relay.	

Total=45

COURSE OUTCOMES

- Ability to suggest suitability circuit breaker.
- Ability to find the causes of abnormal operating conditions of the apparatus and system.

Text Books:

1. Badriram and Vishwakarma D.N., Power System Protection and Switchgear, Tata McGraw Hill, New Delhi, 1995.
2. Rao T.S.M., Power System Protection – Static Relays, McGraw Hill, 1979.

Reference Books:

1. Van C.Warrington, “Protection Relays – Their Theory and Practice”, Chapman and Hall.
2. Ravindranath B. and Chander M., “Power System Protection and Switchgear”, Wiley Eastern, 1992.
3. Russel C.Mason, “The Art and Science of Protective relays”.

AIM

To become familiar with the preparatory work necessary for meeting the next day's operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVES

- i. To get an overview of system operation and control.
- ii. To understand & model power-frequency dynamics and to design power-frequency controller.
- iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNIT I INTRODUCTION 12

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 12

Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC of single & Multi areas - Static & Dynamic Analysis of uncontrolled and controlled cases - Tie line with frequency bias control - Steady state instabilities.

UNIT III REACTIVE POWER-VOLTAGE CONTROL 12

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ -iteration method. (No derivation of loss coefficients.) Base point and participation factors.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies. **Total = 60**

COURSE OUTCOMES

- Ability to understand the day-to-day operation of electric power system.
- Ability to analyze the control actions to be implemented on the system to meet the minute- to-minute variation of system demand.
 - Ability to understand the reactive power-voltage interaction.

TEXT BOOKS

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
3. P. Kundur, 'Power System Stability & Control', McGraw Hill Publications, USA, 1994.

REFERENCE BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

AIM

To simulate analysis and planning cases for a practical power system.

List Of Experiments:

1. Formation of Y-Bus Matrix by Inspection and Singular transformation methods.
2. Load flow solution using Gauss Seidal method
3. Load flow solution using Newton-Raphson method
4. Load flow solution by Fast Decoupled method
5. Symmetrical short circuit analysis
6. Unsymmetrical Fault analysis
7. Solution of swing Equation using modified Euler method
8. Power Electronic Circuits, design and simulation using Pspice
9. Simulation of Electrical drives using MATLAB, PSCAD
10. Control system design using MATLAB

P = 45 Total = 45

COURSE OUTCOMES

- Ability to understand power system planning and operational studies.
- Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- Ability to analyze the power flow using GS and NR method
- Ability to find Symmetric and Unsymmetrical fault

Semester VII

UNIT – I: BASICS OF TQM 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT – II: PRINCIPLES OF TQM 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT – III: QUALITY CONCEPTS 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Concept of six sigma.

UNIT – IV: TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages of FMEA.

UNIT – V: ISO STANDARDS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45**COURSE OUTCOMES**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning,
- organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. Dale H. Besterfield, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker, “TOTAL QUALITY MANAGEMENT”, Anuradha Agencies.

REFERENCES:

1. Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.

2. Oakland.J.S. "Total Quality Management", Butterworth – Heinemann Ltd., Oxford. 1989.
3. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 1996

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of DC machine.
- ii. Construction, operating Characteristics of single and three phase transformer.
- iii. Design and operating characteristics of Induction motors.
- iv Construction, principle of operation, Design of synchronous machines and to have knowledge of machine design in CAD

UNIT I INTRODUCTION 12

Major considerations – Limitations – Electrical Engineering Materials – Space factor – temperature gradient – Heat flow in two dimensions – thermal resistivity of winding – Temperature gradient in conductors placed in slots – Rating of machines – Eddy current losses in conductors – Standard specifications

UNIT II DC MACHINES 12

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes – losses and efficiency calculations.

UNIT III TRANSFORMERS 12

KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise of Transformers – Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 12

Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current – Output equation of Induction motor – Main dimensions –Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor-Operating characteristics –Short circuit current – circle diagram – Dispersion co-efficient – relation between D & L for best power factor.

UNIT V SYNCHRONOUS MACHINES 12

Runaway speed – construction – output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field m.m.f – Design of field winding – Design of turbo

alternators – Rotor design - Introduction to computer aided design – Program to design main dimensions of Alternators.

Total = 60

COURSE OUTCOMES

- Ability to understand basics of design considerations for rotating and static electrical machines
- Ability to design of field system for its application.
- Ability to design single and three phase transformer.
- Ability to design armature and field of DC machines.

REFERENCE BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

22153C73P- POWER PLANT ENGINEERING

4 0 0 4
Semester VII

UNIT I - THERMAL POWER PLANTS 9

Basic thermodynamic cycles – Various components of steam power plant – Layout – Pulverized coal burners – Fluidized bed combustion – Coal handling systems – Ash handling systems – Forced draft and induced draft fans – Boilers – Feed pumps – Super heater – Regenerator – Condenser – Deaerators – Cooling tower

UNIT II - HYDRO ELECTRIC POWER PLANTS 9

Layout – Dams – Selection of water turbines – Types – Pumped storage hydel plants

UNIT III - NUCLEAR POWER PLANTS 9

Principles of nuclear energy – Fission reactions – Nuclear reactor – Nuclear power plants

UNIT IV- GAS AND DIESEL POWER PLANTS 9

Types – Open and closed cycle gas turbine – Work output and thermal efficiency – Methods to improve performance – Reheating, intercoolings, regeneration – Advantage and disadvantages – Diesel engine power plant – Component and layout

UNIT V- NON – CONVENTIONAL POWER GENERATION 9

Solar energy collectors – OTEC – Wind power plants – Tidal power plants and geothermal resources – Fuel cell – MHD power generation – Principle – thermoelectric power generation – Thermionic power generation.

L: 45 T: 15 Total: 60

COURSE OUTCOMES

- Ability to create awareness about renewable Energy Sources and technologies.
- Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- Ability to recognize current and possible future role of renewable energy sources.

TEXT BOOKS

1. Arora and Domkundwar, “A Course in Power Plant Engineering”, Dhanpat Rai.
2. Nag, P.K., “Power Plant Engineering”, 2nd Edition, Tata McGraw Hill, 2003.

REFERENCES

1. Bernhardt, G.A., Skrotzki and William A. Vopat, “Power Station Engineering and Economy”, 20th Reprint, Tata McGraw Hill, 2002.
2. Rai, G.D., “An Introduction to Power Plant Technology”, Khanna Publishers.
3. El-Wakil, M.M., “Power Plant Technology”, Tata McGraw Hill, 198

22153E44AP- ELECTROMAGNETIC THEORY**3 1 0 4**
Semester-IV**AIM**

To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering.

OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.
- To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced Emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.

UNIT I: ELECTROSTATICS – I 12

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications

UNIT II: ELECTROSTATICS – II 12

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

UNIT III: MAGNETOSTATICS 12

Lorentz force, magnetic field intensity (H) – Biot-Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications

UNIT IV: ELECTRODYNAMIC FIELDS 12

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications

UNIT V: ELECTROMAGNETIC WAVES 12

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics,

conductors- skin depth - Poynting vector – Plane wave reflection and refraction – Standing Wave – Applications.

TOTAL = 45

COURSE OUTCOMES

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS

1. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 4 th Edition ,Oxford University Press Inc, First India edition, 2009.
2. Ashutosh Pramanik, ‘Electromagnetism – Theory and Applications’, PHI Learning Private Limited, New Delhi, Second Edition-2009.
3. K.A. Gangadhar, P.M. Ramanathan ‘ Electromagnetic Field Theory (including Antennaes and wave propagation’, 16th Edition, Khanna Publications, 2007..

REFERENCE BOOKS

1. Joseph. A.Edminister, ‘Schaum’s Outline of Electromagnetics, Third Edition Schaum’s Outline Series), Tata McGraw Hill, 2010.
2. William H. Hayt and John A. Buck, ‘Engineering Electromagnetics’, Tata McGraw Hill 8th Revised edition, 2011.
3. Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 2010.
4. Bhag Singh Guru and Hüseyin R. Hiziroglu “Electromagnetic field theory Fundamentals”, Cambridge University Press; Second Revised Edition, 2009

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22153E44BP- FUZZY LOGIC AND ITS APPLICATIONS**3 1 0 4**

Semester-IV

UNIT I -FUZZY LOGIC 7

Fuzzy sets – Fuzzy operation – Fuzzy arithmetic – Fuzzy relational equations – Fuzzy measure – Fuzzy functions – approximate reasoning – Fuzzy proposition – Fuzzy quantifiers-if-then rules.

UNIT II- FUZZY LOGIC IN CONTROL 8

Structure of Fuzzy logic controller – Fuzzification models – database – rule base – inference engine – defuzzification modules – Non-Linear fuzzy control – PID like FLC – Sliding mode FLC – Sugeno FLC – adaptive fuzzy control applications – case studies.

UNIT III- NEURAL NETWORKS IN CONTROL 8

Neural Network for Non-Linear systems – schemes of Neuro control-system identification forward model and inverse model – indirect learning neural network control applications – Case studies.

UNIT IV- MODELING AND CONTROL OF FACTS DEVICES NEURAL AND FUZZY TECHNIQUE 10

FACTS-concept and general system considerations, types of FACTS devices – special purpose FACTS devices, generalized and multifunctional FACTS devices – General comments on transient stability programs. Neuro – Fuzzy based FACTS controller for improvement of Transient stability systems – GA for Adaptive fuzzy system – case study.

UNIT V- STABILITY STUDIES UNDER MULTIPLE FACTS ENVIRONMENT 12

Introduction to small signal analysis – simulation and modeling of FACTS controllers for small signal analysis. Comparison between dynamic and transient stability results. Introduction to EMTP – (Electromagnetic Transient programme / Package), Modeling of FACTS controllers for power system studies using EMTP.

TOTAL=45**COURSE OUTCOMES**

- | • Ability to design combinational and sequential Circuits.
- | • Ability to simulate using software package.
- | • Ability to study various number systems and simplify the logical expressions using Boolean functions
- | • Ability to design various synchronous and asynchronous circuits.
- | • Ability to introduce asynchronous sequential circuits and PLDs

- Ability to introduce digital simulation for development of application oriented logic circuits.

REFERENCES:

1. KOSKO. B. "Neural Networks and Fuzzy systems", Prentice-Hall of India Pvt.Ltd., 1994.
2. Driankov, Hellendroon, "Introduction to Fuzzy control" Narosa Publisher.
3. Ronald R.Yager and Dimitar P.Filev "Essential of fuzzy modeling and control " John Wiley & Sons, Inc.
4. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho" FACTS – Modeling and simulation in Power Networks" John Wiley & Sons.
5. Kundur P., "Power system stability and control", McGraw Hill, 1994.

22153E44CP - BIOMEDICAL INSTRUMENTATION**4 0 0 4**

Semester-IV

AIM

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

- i. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- ii. To introduce the student to the various sensing and measurement devices of electrical origin.
- iii. To provide the latest ideas on devices of non-electrical devices.
- iv. To bring out the important and modern methods of imaging techniques.
- v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I BASIC PHYSIOLOGY 9

Cells and their structures – Transport of ions through cell membrane – Resting and excited state – Tran membrane potential – Action potential – Bio-electric potential – Nervous system – Physiology of muscles – Heart and blood circulation – Respiratory system – Urinary system.

UNIT II BASIC TRANSDUCER PRINCIPLES AND ELECTRODES 9

Transducer principles - Active transducers - Passive transducers -Transducer for Bio-medical application -Electrode theory- Bio-potential electrode - Bio - chemical transducer.

UNIT III CARDIOVASCULAR SYSTEM 9

The heart and cardiovascular system – Blood pressure – Characteristics of blood flow – Heart sounds - Electro cardiography – Measurements of blood pressure – Measurement of blood flow and cardiac O/P Plethysmography – Measurements of heart sounds.

UNIT IV X-RAY AND RADIOISOTOPE INSTRUMENTATION 9

X-ray imaging radiography – Fluoroscopy – Image intensifiers – Angiography - Medical use of radioisotopes – Beta radiations – Detectors – Radiation therapy.

UNIT V BIO-TELEMETRY 9

Introduction to biotelemetry – Physiological parameters adaptable to biotelemetry – the components of biotelemetry systems – Implantable units – Applications of telemetry in patient care – Application of computer in Bio-medical instrumentation, Anatomy of Nervous system – Measurement from the nervous system – EEG – EMG.

Total = 45**COURSE OUTCOMES**

- Ability to understand fundamentals of Bio medical instrumentation.
- To acquire knowledge on Bio-Medical and Non-Electrical parameter measurements.

- To know the various medical imaging equipment.

REFERENCE BOOKS:

1. Lesis Cromwell Fred, J.Werbell and Erich A.Pfrafraffer, Biomedical instrumentation and Measurements – Prentice Hall of India, 1990.
2. M.Arumugam, Bio-medical Instrumentation – Anuradha Agencies Publishers, 1992.
3. Khandpur, Handbook on Biomedical Instrumentation – Tata McGraw Hill Co Ltd., 1989.

22153E44DP - MODELING AND SIMULATION OF SOLAR ENERGY SYSTEMS

4004

UNIT I: SOLAR RADIATION AND COLLECTORS 9

Solar angles - day length, angle of incidence on tilted surface - Sunpath diagrams - shadow determination - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT II: APPLICATIONS OF SOLAR THERMAL TECHNOLOGY 9

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying.

UNIT III: SOLAR PV FUNDAMENTALS 9

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetero junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell – efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells - preparation of metallurgical, electronic and solar grade Silicon - production of single crystal Silicon: Czochralski (CZ) and Float Zone (FZ) method - Design of a complete silicon – GaAs- InP solar cell - high efficiency III-V, II-VI multi junction solar cell; a-Si-H based solar cells-quantum well solar cell -thermophotovoltaics.

UNIT IV: SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS 9

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking – use of computers in array design - quick sizing method - array protection and trouble shooting - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT V: SOLAR PASSIVE ARCHITECTURE 9

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort – concept

of solar temperature and its significance - calculation of instantaneous heat gain through building envelope.

TOTAL: 45

COURSE OUTCOMES

- Basic knowledge in Power system planning, operation and modeling of large scale power systems.
- Ability to understand the various faults occurring in power system and to solve load flow problems using numerical methods.
- Ability to analyze the power system transients and faults and select the rating for protective devices.

TEXT BOOKS:

1. Sukhatme S P, Solar Energy, Tata McGraw Hill, 1984.
2. Kreider, J.F. and Frank Kreith, Solar Energy Handbook, McGraw Hill, 1981.
3. Goswami, D.Y., Kreider, J. F. and Francis., Principles of Solar Engineering, 2000.

REFERENCES:

1. Garg H P., Prakash J., Solar Energy: Fundamentals & Applications, Tata BMcGraw Hill, 2000.
2. Duffie, J. A. and Beckman, W. A., Solar Engineering of Thermal Processes, John Wiley, 1991.
3. Alan L Fahrenbruch and Richard H Bube, Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press, 1983.
4. Larry D Partain, Solar Cells and their Applications, John Wiley and Sons, Inc, 1995.
5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2004.
6. Sodha, M.S, Bansal, N.K., Bansal, P.K., Kumar, A. and Malik, M.A.S. Solar Passive Building, Science and Design, Pergamon Press, 1986.
7. Krieder, J and Rabi, A., Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.

22153E44EP **NON-CONVENTIONAL ENERGY SYSTEMS AND APPLICATIONS** 2024

AIM

To learn about the Renewable energy system and conversion technologies related to various aspects of non-conventional systems.

OBJECTIVES

- to identify suitable utility for the solar and wind energy systems,
- to conduct a site survey for installation of a windmill during Sixth Expedition ,
- to study the structural and foundation aspects for installing a windmill at Maitree station in Schirmacher hills

UNIT-I 9

Introduction to renewable energy various aspects of energy conversion-Principle of renewable energy systems environment and social implications.

Indian energy scenario in various sectors— Present conventional and renewable energy status- Global energy status-Per capita energy consumption-Future energy plans.

UNIT-II 9

Solar energy: Solar radiation components- measurements-estimation-solar collectors-solar water heaters- Calculation-Types-analysis-economics-Applications Solar thermal power generation Solar Photovoltaics- energy conversion principle-classifications-equivalent circuit-characteristics-Cell efficiency- Limitations-PV modules-MPPT algorithms

UNIT-III 9

Wind energy: Basics of wind-wind turbines-power and energy from wind turbine-characteristics- types of electric generators for wind power generation. Dynamics matching- performance of wind generators - applications- economics of wind power

UNIT-IV 9

Storage Devices: Super capacitor-SMES- Battery storage-flywheel storage- compressed air storage- Fuel cells–types and applications; MHD generators – backup -System design-industrial and domestic applications.

UNIT-V 9

Bioenergy: Bio fuels-classification-biomass conversion technologies-applications; Ocean Energy: Tidal energy-wave energy-ocean thermal energy conversion systems-applications; - mini, micro and pico hydel power

Total : 45

TEXT/REFERENCE BOOKS:

1. Godfrey Boyle, “Renewable Energy: Power for a sustainable future”, Oxford University press, Second edition.

2. Rai G D, "Solar Energy Utilization", Khanna Publishers, 1997.
3. B H Khan, "Non-Conventional Energy Resources", The McGraw-Hill Companies, Second Edition.
4. Sukhatme, S.P, "Solar Energy -Principles of Thermal Collection and Storage", Tata
5. McGraw-Hill, 2 ed., 1997.
6. Sammes, Nige, "Fuel Cell Technologies-State and Perspectives", Springer publication, 2005
7. Kreith, F., and Kreider, J.F., "Principles of Solar Engineering", Mc-Graw-Hill Book Co, 1978.
8. S.L.Soo , "Direct Energy Conversion" , Prentice Hall Publication, 1968
9. James Larminie, Andrew Dicks, "Fuel Cell Systems", Wiley & Sons Ltd, 2ed, 2003.

Referance from Reputed University

Percentage of syllabus revised 10%

Syllabus Focus on Environment

ELECTIVE-II
SEMESTER-V

22153E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNIT I- INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineral resources: use and effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT II-ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem. Introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III -ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards — role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV-SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management
environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. environment production act – air (prevention and control

of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

UNIT V-HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – hiv / aids – women and child welfare – role of information technology in environment and human health – case studies.

TOTAL : 45

COURSE OUTCOMES

- Play a important role in transferring a healthy environment for future generations
- Analyze the impact of engineering solutions in a global and societal context
- Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems

TEXT BOOKS

1. Gilbert M .Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., Ahmedabad India.
2. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. “Environmental Management”, W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, “Essentials of Ecology, Blackwell Science.
6. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

22153E54BP - ARTIFICIAL NEURAL NETWORKS

4 0 0 4

UNIT I : INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 12

Biological neural networks - Pattern analysis tasks: Classification, Regression, Clustering

- Computational models of neurons - Structures of neural networks - Learning principles

UNIT II: LINEAR MODELS FOR REGRESSION AND CLASSIFICATION 12

Polynomial curve fitting - Bayesian curve fitting - Linear basis function models - Bias-

variance decomposition - Bayesian linear regression - Least squares for classification -

Logistic regression for classification- Bayesian logistic regression for classification

UNIT III: FEEDFORWARD NEURAL NETWORKS 12

Pattern classification using preceptor - Multilayer feed forward neural networks

(MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back

propagation learning - Fast learning methods: Conjugate gradient method – Auto

associative neural networks - Bayesian neural networks

UNIT III: RADIAL BASIS FUNCTION NETWORKS 12

Regularization theory - RBF networks for function approximation - RBF networks for

pattern classification

UNIT IV: KERNEL METHODS FOR PATTERN ANALYSIS 12

Statistical learning theory- Support vector machines for pattern classification- Support

vector regression for function approximation- Relevance vector machines for

classification and regression

UNIT V: SELF-ORGANIZING MAPS 12

Pattern clustering- Topological mapping- Kohonen's self-organizing map

FEEDBACK NEURAL NETWORKS

Pattern storage and retrieval- Hopfield model- Boltzmann machine- Recurrent neural networks

TOTAL=60

COURSE OUTCOMES

- Analysis of transients using various parametric & non parametric methods.
- Analysis of various control schemes used for controlling applications
- study about the adaptive control systems for various applications & study of issues in it.

Text Books:

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

22153E54CP-VLSI DESIGN

3 1 0 4

OBJECTIVES:

- In this course, the MOS circuit realization of the various building blocks that is common to any
- microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in
- CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL 45

COURSE OUTCOMES

Upon completion of the course, students should

- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

TEXTBOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addison Wesley, 1997

REFERENCES:

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addison Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

22153E54DP- ROBOTICS

3 1 0 4

UNIT I: INTRODUCTION 9

Robot ,its evaluation; definition and aes of robotics, present application status.

UNIT II: ROBOT ANATOMY 9

configuration, robot motions, work volume. Robot drives, actuators and control; Functions and types of drives and actuators; concept of basic control systems, open loop, close loop, different type of controllers, ON-OFF, proportional, integral, PI, PD, PID.

UNIT III: ROBOT END EFFECTORS: 9

Types of end effecters, mechanical gripper, tools and end effectors. Robot sensors: Transducers and sensors; analog and digital transducers; types of sensors, tachfile sensors, proximity and rough sensors ; miscellaneous sensors; vision systems; use of sensors in robotics.

UIT IV: ROBOT KINEMATICS 9

Position representations; forward and reverse kinematics of three and four degrees of freedom; robot arm; homogeneous transformations and robot kinematics; kinematics equations using homogeneous transformation

UNIT V: INDUSTRIAL APPLICATION 9

Capabilities of robots; robot applications; materials handling; pick and place operation; palletiging and depalletiging; machine loading and unloading; machine casting; welding;painting,assembly; inspection; maintenance.

COURSE OUTCOMES

- Ability to understand and develop MFC windows applications with inputs and drawing features and implement menus using VC++
- Ability to understand document/view architecture and develop classic controls using VC++
- Ability to understand and design event driven programming and activeX controls and manage database using visual basic

BOOKS RECOMMENDED:

- 1.Schilling-Fundamental of robotics; PH
- 2.Yoshikawa- Fundamental of robotics; PH
3. S.R.Deb-Robotics Technology and Flexible Automation
4. Introduction to Robotics, John J Craig; Pearson Education

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

- To develop expression for computation of fundamental parameters of Power system analysis.
- To categorize the lines into different classes and develop equivalent circuits for these classes.
- To analyze the voltage distribution in Architectures and user interface.

UNIT-I**9**

Power system-general concepts-distribution of power, load and energy forecasting-factors in power system loading, Power system analysis-load flow-fault studies-voltage control.

UNIT-II**9**

Optimization of distribution system network cost modeling-economic loading of distribution transformers. Distribution system reliability-reliability assessment techniques

UNIT-III**9**

Consumer services-maximum demand, diversity and load factor-consumer load control for power shortages, Tariffs-costing and pricing –economically efficient tariff structure. Overhead and underground lines-optimum design considerations, Power capacitors-size of capacitor for power factor improvement- HT and LT capacitor installation requirements.

UNIT-IV**9**

Distribution System Design- Electrical Design Aspects of Industrial, Commercial Buildings- Design, estimation and costing of outdoor and indoor Substations, Electrical Safety and Earthing Practices at various voltage levels- Lightning protection.-Regulations and standards.

UNIT-V**9**

Distribution Automation System : Necessity, System Control Hierarchy- Basic Architecture and implementation Strategies for SCADA and DAC systems -Basic Distribution Management System Functions. Communication Systems for Control and Automation- Wireless and wired Communications- SCADA and DAC communication Protocols, Architectures and user interface

Total: 45

Text/References:

1. Turan Gonen, "Electric Power Distribution system Engineering" Mc Graw-hill ,Inc,1987
2. A.S. Pabla, " Electric Power Distribution systems" Tata Mc Graw-hill Publishing company limited, 4th edition, 1997.
3. Alexander Eigeles Emanuel, "Power Definitions and the Physical Mechanism of Power Flow", John Wiley & Sons, October 2009.
4. "Handbook of International Electrical Safety Practices", John Wiley & Sons, PERI June 2009.
5. Ali A. Chowdhury, Don O. Koval, "Power distribution system reliability-Practical methods and applications" John Wiley & sons Inc., *IEEE Press* 2009
6. Richard E.Brown, "Electric power distribution reliability" Taylor & Francis Group,LLC,2009.
7. James Northcote-Green, Robert Wilson, "Control and automation of electrical power distribution system", Taylor & Francis Group, LLC,2007.
8. S.Sivanagaraju, V.Sankar, Dhanpat Rai & Co, "Electrical Power Distribution and Automation",2006.
9. Pansini,Anthony J, "Guide to electrical power distribution system",Fairmont press, inc., 6th edition,2006.
10. Stuart A. Boyer, "SCADA-Supervisory Control and Data Acquisition" Instrument Society of America Publication,2004
11. Leveque, Francois , "Transport Pricing of Electricity Networks" Springer 2003
13. Lakervi & E J Holmes, "Electricity distribution network design", Peter Peregrinus Ltd. 2nd Edition,2003
13. William H. Kersting, "Distribution system modeling and analysis" CRC press LLC, 2002.
14. Michael Wiebe, "A Guide to Utility Automation: Amr, Scada, and It Systems for Electric Power" PennWell,1999.
15. IEEE Press: IEEE Recommended practice for Electric Power Distribution for Industrial Plants, publish

22153E64AP- PRINCIPLES OF MANAGEMENT 4 0 0 4

OBJECTIVE

- i. To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- ii. To understand the statistical approach for quality control.
- iii. To create an awareness about the ISO and QS certification process and its need for the

industries

UNIT I HISTORICAL DEVELOPMENT 12

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 12

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 12

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 12

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 12

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL = 60

COURSE OUTCOMES

- Basic Knowledge on management, business, organization culture, environment and planning process.
- Ability to organize business activities, motivational techniques and effective communication.
- Ability to understand the management control and budgetary techniques.

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCE BOOKS

1. Tripathy PC And Reddy PN, “ Principles of Management”, Tata Mcgraw Hill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “ Engineering Management”, Addison Wesley,-2000.

22153E64BP- MICRO ELECTRO MECHANICAL SYSTEMS 4 0 0 4

AIM :

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION 9

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

UNIT III SENSORS AND ACTUATORS-I 9

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING 9

Silicon Anisotropic Etching – Anisotropic Wet Etching – Dry Etching of Silicon – Plasma Etching –Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process..

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

Total = 45

COURSE OUTCOMES

- Ability to understand the operation of micro devices, micro systems and their applications.
- Ability to design the micro devices, micro systems using the MEMS fabrication process.

TEXT BOOKS

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS

1. Nadim Maluf, "An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.
5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.

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22153E64CP

INTEGRATED OPTO-ELECTRONIC DEVICES

3 1 0 4

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVE

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To understand different light modulation techniques and the concepts and applications of optical switching.

UNIT I: ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III: OPTICAL DETECTION DEVICES 9

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated circuits, integrated transmitters and Receivers, Guided wave devices.

COURSE OUTCOMES

- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to know the basic properties of laser and to apply for industry.
- Recognize the importance of laser in medicinal and industry applications.

TEXTBOOK

1. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall of India Pvt. Ltd.,NewDelhi,1995.

REFERENCES

1. Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., NewDelhi,1995.
2. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, McGraw-Hill International Edition, 1998.

22153E64DP - COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS

3 1 0 4

AIM

To introduce the basics of Computer Aided Design technology for the design of Electrical Machines.

OBJECTIVE

At the end of this course the student will be able to

- Learn the importance of computer aided design method.
- Understand the basic electromagnetic field equations and the problem formulation for CAD applications.
- Become familiar with Finite Element Method as applicable for Electrical Engineering.
- Know the organization of a typical CAD package.
- Apply Finite Element Method for the design of different Electrical apparatus.

UNIT I: INTRODUCTION 12

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II: MATHEMATICAL FORMULATION OF FIELD PROBLEMS 12

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNIT III: PHILOSOPHY OF FEM 12

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variation method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques.

UNIT IV: CAD PACKAGES 12

Elements of a CAD System –Pre-processing – Modeling – Meshing – Material properties- Boundary Conditions – Setting up solution – Post processing.

UNIT V: DESIGN APPLICATIONS 12

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

COURSE OUTCOMES

- The students will obtain the knowledge of basic electric and magnetic materials and design of rotating electrical Machines and Transformers.
- The students will be able to overall design the machines and transformers.

- The students will gain knowledge about the various types of electrical machines and design of both ac & dc Machines and many application.

TEXT BOOKS

1. S.J Salon, 'Finite Element Analysis of Electrical Machines', Kluwer Academic Publishers, London, 1995.
2. Nicola Bianchi, 'Electrical Machine Analysis using Finite Elements', CRC Taylor & Francis, 2005.

REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, 'Electromagnetic Modeling by Finite Element Methods', Marcell Dekker Inc., 2003.
2. P.P.Silvester and Ferrari, 'Finite Elements for Electrical Engineers', Cambridge University Press, 1983.
3. D.A.Lowther and P.P Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, New York, 1986.
4. S.R.H.Hoole, 'Computer Aided Analysis and Design of Electromagnetic Devices', Elsevier, New York, 1989.
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.

22153E64EP **ADVANCED DC-AC POWER CONVERSION** 2024

AIM

To study advanced DC-AC power conversion technologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I **TWO-LEVEL VOLTAGE SOURCE INVERTER** 9

Introduction - **Sinusoidal PWM** - Modulation Scheme - Harmonic Content – Over-modulation – Third Harmonic Injection PWM - **Space Vector Modulation** - Switching States - Space Vectors - Dwell Time Calculation - Modulation Index - Switching Sequence - Spectrum Analysis - Even-Order Harmonic Elimination - Discontinuous Space Vector Modulation

UNIT-II **CASCADED H-BRIDGE (CHB) MULTILEVEL INVERTERS** 9

Introduction - **H-Bridge Inverter** - Bipolar Pulse-Width Modulation - Unipolar Pulse-Width Modulation –**Multilevel Inverter Topologies** - CHB Inverter with Equal dc Voltage - H-Bridges with Unequal dc Voltages.

Carrier Based PWM Schemes - Phase-Shifted Multicarrier Modulation - Level-Shifted Multicarrier Modulation - Comparison Between Phase- and Level-Shifted PWM Schemes - Staircase Modulation.

UNIT-III **DIODE-CLAMPED MULTILEVEL INVERTERS** 9

Introduction -**Three-Level Inverter** - Converter Configuration - Switching State - Commutation - Space Vector Modulation - Stationary Space Vectors - Dwell Time Calculation - Relationship Between V_{ref} Location and Dwell Times - Switching Sequence Design - Inverter Output Waveforms and Harmonic Content - Even-Order Harmonic Elimination - **Neutral-Point Voltage Control** - Causes of Neutral-Point Voltage Deviation – Effect of Motoring and Regenerative Operation - Feedback Control of Neutral-Point Voltage

UNIT-IV 9

Other Space Vector Modulation Algorithms - Discontinuous Space Vector Modulation - SVM Based on Two-level Algorithm **High-Level Diode-Clamped Inverters** - Four- and Five-Level Diode-Clamped Inverters - Carrier-Based PWM– **Other Multilevel Voltage Source Inverters** – Introduction - **NPC/H-Bridge Inverter** - Inverter Topology - Modulation Scheme - Waveforms and Harmonic Content - **Multilevel Flying-Capacitor Inverters** – Inverter Configuration - Modulation Schemes

UNIT-V **PWM CURRENT SOURCE INVERTERS** 9

Introduction - PWM Current Source Inverter - Trapezoidal Modulation - Selective Harmonic Elimination -**Space Vector Modulation** - Switching States - Space Vectors - Dwell Time Calculation - Switching Sequence - Harmonic Content - SVM Versus TPWM and SHE - **Parallel Current Source Inverters** - Inverter Topology -Space Vector Modulation for Parallel Inverters - Effect of Medium Vectors on dc Currents - dc Current Balance Control - Load-Commutated Inverter (LCI)

Total: 45

TEXT/REFERENCE BOOKS:

1. B. Woo, "High Power Converters and AC Drives", John Wiley & Sons, 2006
2. Ned Mohan et.al , "Power Electronics" ,John Wiley and Sons,2006
3. Rashid, "Power Electronics, Circuits Devices and Applications", Pearson Education, 3rd edition, 2004.
4. G.K.Dubey, Thyristorised Power Controllers, Wiley Eastern Ltd, 1993.
5. Dewan & Straughen, Power Semiconductor Circuits, John Wiley & Sons, 1975.
6. Cyril W Lander, Power Electronics, Mc Graw Hill, 3rd edition, 1993.

22153E74AP - POWER SYSTEM TRANSIENTS

3 0 0 3
Semester VII

AIM

To understand generation of switching and lightning transients, their propagation, reflection and refraction on the grid and their impact on the grid equipment.

OBJECTIVES

- i. To study the generation of switching transients and their control using circuit – theoretical concept.
- ii. To study the mechanism of lightning strokes and the production of lightning surges.
- iii. To study the propagation, reflection and refraction of travelling waves.
- iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 7

Various types of power system transients - effects of transients on power systems.

UNIT II LIGHTNING AND SWITCHING SURGES 19

Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNIT III MODELLING OF POWER SYSTEM EQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNIT IV COMPUTATION OF TRANSIENT OVERVOLTAGES 14

Computation of transients – traveling wave method, Bewley's lattice diagram – analysis in time and frequency domain, EMTP for transient computation.

UNIT V INSULATION COORDINATION 12

Insulation co-ordination – over voltage protective devices principles of recent co-ordination and design of EHV lines. **Total = 60**

COURSE OUTCOMES

- Ability to understand and analyze power system transients and types of switching transients.
- To get knowledge about lightning transients and high voltage transient behavior travelling on line.
- To get knowledge about transients in integrated power systems.

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter science, New York, 2nd edition 1991.
2. R.D Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCES

1. Klaus Ragaller, 'Surges in High Voltage Networks', Plenum Press, New York, 1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

22153E74BP - **EHV AC and DC TRANSMISSION SYSTEMS**

3 0 0 3

UNIT I TRANSMISSION ENGINEERING 9
Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.

UNIT II LINE PARAMETER 9
Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.

UNIT III POWER CONTROL 9
Power frequency and voltage control – voltage control – Over voltages – Power circle diagram – Voltage control using shunt and series compensation – Static VAR compensation – Higher Phase order system – FACTS.

UNIT IV EHV AC Transmission 9
Design of EHV lines based in steady state limits and transient over voltages – Design of extra HV cable transmission – XLPE cables – Gas insulated cable – Corona and RIV.

UNIT V HVDC TRANSMISSION 9
HVDC Transmission principles – Comparison of HVAC and HVDC transmission – Economics – types of Converters – HVDC links – HVDC control – Harmonics – Filters – Multi terminal DC System – HVDC cables and HVDC circuit breakers.

Total=45

COURSE OUTCOMES

- Basic knowledge of HVDC Transmission, its components, types and applications
- Ability to analyze and design the Converter circuits, System Control Techniques
- Ability to design filters for harmonic control and perform power flow analysis using Per unit system for DC Quantities.

Reference Books:

1. Rakosh Das Begamudre, 'Extra HVDC Transmission Engineering', Wiley Eastern Ltd, 1990.
2. Padiyar K.R., 'HVDC Power Transmission systems', Wiley Eastern Ltd, 1993.
3. Allan Greenwood, 'Electrical transients in power Systems', John Eastern Ltd, New York, 1992.
4. Arrilaga J., 'HVDC transmission', Peter Perengrinus Ltd, London, 1983.

22153E74CP -

Fundamentals of Nanoscience

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thin films multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic,

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

9

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nano alumina, CaO, AgTiO₂, Ferrites, Nano clays functionalization and applications- Quantum wires, Quantum dots-preparation, properties and applications..

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nano indentation.

UNIT V APPLICATIONS

9

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

L= 45 Total = 45

COURSE OUTCOMES

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammeearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.

2. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCE BOOKS

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.



AIM

To gain knowledge in analysis of non-linear system and digital control of linear system.

OBJECTIVES

- i. To study the description and stability of non-linear system.
- ii. To study the conventional technique of non-linear system analysis.
- iii. To study the analysis discrete time systems using conventional techniques.
- iv. To study the analysis of digital control system using state-space formulation.
- v. To study the formulation and analysis of multi input multi output (MIMO) system.

UNIT I NON-LINEAR SYSTEM – DESCRIPTION & STABILITY**9**

Linear vs non-linear – Examples – Incidental and Intentional – Mathematical description - Equilibria and linearisation - Stability – Lyapunov function – Construction of Lyapunov function.

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS**9**

Construction of phase trajectory – Isocline method – Direct or numerical integration – Describing function definition – Computation of amplitude and frequency of oscillation.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM**9**

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot. Design of Discrete PID controller – discrete state feedback controller and discrete compensator.

UNIT IV STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM**9**

State equation – Solutions – Realization – Controllability – Observability – Stability Jury's test.

UNIT V MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:**9**

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

L = 45 Total = 45**COURSE OUTCOMES**

- Develop mathematical models and understand the mathematical relationships between
- the sensitivity functions and how they govern the fundamentals in control systems.
- Design and fine tune PID controllers and understand the roles of P, I and D in feedback control and develop state-space models

- Advanced filters design for various control applications with proper error estimation techniques.

TEXT BOOKS

1. Benjamin C. Kuo, 'Digital Control Systems', Oxford University Press, 1992.
2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

REFERENCE BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Raymond T. Stefani & Co., 'Design of feed back Control systems', Oxford University, 2002.
3. William L. Luyben and Michael L. Luyben, 'Essentials of Process Control', McGraw Hill International Editions, Chemical Engineering Series, 1997.

Reference from Reputed University

Percentage of syllabus revised 10%

Syllabus focus on Employability and Innovation

AIM

To study low power SMPS and UPS technologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I Introduction 9

Linear regulator Vs. Switching regulator – Topologies of SMPS – isolated and non isolated topologies – Buck – Boost – Buck boost – Cuk – Polarity inverting topologies – Push pull and forward converters half bridge and full bridge – Fly back converters Voltage fed and current fed topologies. EMI issues.

UNIT-II Design Concepts 9

Magnetic Circuits and design – Transformer design - core selection – winding wire selection – temperature rise calculations - Inductor design. Core loss – copper loss – skin effect - proximity effect. Power semiconductor selection and its drive circuit design – snubber circuits. Closing the feedback loop – Control design – stability considerations

UNIT-III Control Modes 9

Voltage Mode Control of SMPS.. Transfer Function and Frequency response of Error Amp. Transconductance Error Amps. PWM Control ICs (SG 3525,TL 494,MC34060 etc.) Current Mode Control and its advantages. Current Mode Vs Voltage Mode. Current Mode PWM Control IC(eg.UC3842).

UNIT-IV Applications of SMPS 9

Active front end – power factor correction – High frequency power source for fluorescent lamps - power supplies for portable electronic gadgets.

UNIT-V Resonant converters 9

Principle of operation – modes of operation – quasi resonant operation- advantages.

Total : 45

Text/Reference Books:

1. Abraham I Pressman - Switching power supply design – 2nd edition 1998 Mc-Graw hill Publishing Company.
2. Keith H Billings - Switch mode power supply handbook – 1st edition 1989 Mc-Graw hill Publishing Company.
3. Sanjaya Maniktala - Switching power supplies A to Z. – 1st edition 2006, Elsevier Inc.
4. Daniel M Mitchell : DC-DC Switching Regulator Analysis. McGraw Hill Publishing Company
5. Ned Mohan et.al : Power Electronics. John Wiley and Sons.
6. Otmar Kilgenstein : Switched Mode Power Supplies in Practice. John Wiley and Sons.
7. Mark J Nave : Power Line Filter Design for Switched-Mode Power Supplies. Van Nostrand Reinhold, New York.

22153P75P Project Work

- The student will use their ability to design electrical, electronic systems and signals through modeling, simulation, experimentation, interpretation and analysis to build, test, and debug prototype circuits and systems and analyze results using the principles of design to solve open-ended engineering problems.
- The students will be able to take professional decisions based on the impact of socio- economic issues by their self-confidence, a high degree of personal integrity, and the belief that they can each make a difference by developing persuasive communication skills in a variety of media by engaging them in team-based activities, and by strengthening their interpersonal skills. This will lead to develop the leadership qualities by making the students to identify their personal values and demonstrate the practice of ethical leadership.
- The students will be able to appreciate the importance of optimization, commercialization, and innovation as the desired features of the designed system



**PONNAIYAH RAMAJAYAM INSTITUTE OF
SCIENCE & TECHNOLOGY (PRIST)**

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

**SCHOOL OF ENGINEERING AND
TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL &
ELECTRONICS ENGINEERING**

PROGRAM HANDBOOK

B.Tech FULL TIME

[Regulation 2021]

**[for candidates admitted to B.Tech EEE program from June
2021 onwards]**

PROGRAMME EDUCATIONAL OBJECTIVES:

- PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.
- PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.
- PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

- A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- B. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- C. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- D. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- E. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- F. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- G. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- H. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- I. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- J. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- K. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- L. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH
PROGRAMME OUTCOMES**

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMM OUTCOMES												
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	3	2	3	2	1	1	2	1	1	3	1	3
2	3	3	3	3	3	1	1	1	1	1	1	2	2
3	3	3	3	3	3	2	2	3	1	2	2	2	2

1-Reasonable: 2- Significant: 3- Strong

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

COURSE STRUCTURE

B. TECH-EEE R 2021

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER I

S.No	Course Code	Course Title	L	T	P	C
1	21147IP	Induction Programme	-	-	-	0
2	21147S11	Professional English – I	3	0	0	3
3	21148S12	Matrices and Calculus	3	1	0	4
4	21149S13	Engineering Physics	3	0	0	3
5	21149S14	Engineering Chemistry	3	0	0	3
6	21150S15	Problem Solving and Python programming	3	0	0	3
7	21150L16	Problem Solving and Python Programming Laboratory	0	0	4	2
8	21149L17	Physics and Chemistry Laboratory	0	0	4	2
9	21147L18	Communication Laboratory - I	0	0	2	1
TOTAL CREDITS						21

SEMESTER – II

S.No	Course Code	Course Name	L	T	P	C
1	21147S21	Professional English – II	2	0	0	2
2	21148S22	Statistics and Numerical Methods	3	1	0	4
3	21149S23C	Physics for Electrical Engineering	3	0	0	3
4	21154S24	Engineering Graphics	2	0	4	4
5	21154S25	Basic Civil and Mechanical Engineering	3	0	0	3
6	21153S26B	Electric Circuit Analysis	3	1	0	4
7	21154L21	Engineering Practices Laboratory	0	0	4	2
8	21153L22B	Electric Circuits Laboratory	0	0	4	2
9	21147L23	Communication Laboratory - II	0	0	4	2
TOTAL CREDITS						26

SEMESTER III

S.No	Course Code	Course Name	L	T	P	C
1	21148S31C	Probability and Complex Functions	3	1	0	4
2	21153C32	Digital Logic Circuits	3	0	0	3
3	21153C33	Electromagnetic Fields	3	1	0	4
4	21153C34	Electrical Machines – I	3	0	0	3
5	21153S35	Electron Devices and Circuits	3	0	0	3
6	21153S36	C Programming and Data Structures	3	0	0	3
7	21153L31	Electronic Devices and Circuits Laboratory	0	0	4	2
8	21153L32	Electrical Machines Laboratory – I	0	0	4	2
9	21153L33	C Programming and Data Structures Laboratory	0	0	4	2
10	21153L34	Professional Development	0	0	2	1
TOTAL CREDITS						27

SEMESTER IV

S.No	Course Code	Course Name	L	T	P	C
1	21153C41	Electrical Machines – II	3	0	0	3
2	21153C42	Transmission and Distribution	3	0	0	3
3	21153C43	Measurements and Instrumentation	3	0	0	3
4	21153C44	Linear Integrated Circuits	3	0	0	3
5	21153C45	Microprocessors and Microcontrollers	3	0	0	3
6	21149S46	Environmental Sciences and Sustainability	2	0	0	2
7	21153L47	Electrical Machines Laboratory - II	0	0	4	2
8	21153L48	Linear and Digital Circuits Laboratory	0	0	4	2
9	21153L49	Microprocessors and Microcontrollers Laboratory	0	0	4	2
TOTAL CREDITS						23

SEMESTER - V

S.No	Course Code	Course Name	L	T	P	C
1	21153C51	Power System Analysis	3	0	0	3
2	21153C52	Control Systems	3	0	0	3
3	21153C53	Power Electronics	3	0	0	3
4	21153E54_	Elective I	3	0	0	3
5	21153E55_	Elective II	2	0	2	3
6	21153E56_	Elective III	2	0	2	3
7	21147MC51_	Mandatory Course I	3	0	0	0
8	21153L57	Control and Instrumentation Laboratory	0	0	4	2
9	21153L58	Power Electronics Laboratory	0	0	4	2
TOTAL CREDITS						22

SEMESTER - VI

S.No	Course Code	Course Name	L	T	P	C
1	21150OE61_	Open Elective I	2	0	2	3
2	21153C62	Power System Operation and Control	3	0	0	3
3	21153C63	Protection and Switchgear	3	0	0	3
4	21153E64_	Elective IV	3	0	0	3
5	21153E65_	Elective V	2	0	2	3
6	21153E66_	Elective VI	2	0	2	3
7	21147MC61_	Mandatory Course II	3	0	0	0
8	21153L67	Power System Laboratory	0	0	4	2
TOTAL CREDITS						20

SEMESTER – VII

S.No	Course Code	Course Name	L	T	P	C
1	21147S71	Human Values and Ethics	2	0	0	2
2	211_ _OE72_	Open Elective II	2	0	2	3
3	211_ _OE73_	Open Elective III	3	0	0	3
4	211_ _OE74_	Open Elective IV	3	0	0	3
5	21160E75_	Elective VII	3	0	0	3
6	21153E76_	Elective VIII	2	0	2	3
7	21153C77	High Voltage Engineering	3	0	0	3
TOTAL CREDITS						20

SEMESTER – VIII

S.No	Course Code	Course Name	L	T	P	C
1.	21153P81	Project Work/ Internship	0	0	20	10
TOTAL CREDITS						10

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LIST OF ELECTIVES

MANDATORY COURSES I (V SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	21147MC51A	Introduction to Women and Gender Studies	3	0	0	0
2.	21147MC51B	Elements of Literature	3	0	0	0
3.	21147MC51C	Film Appreciation	3	0	0	0
4.	21147MC51D	Disaster Management	3	0	0	0

MANDATORY COURSES II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	21147MC61A	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	3	3	0	0
2.	21147MC61B	History of Science and Technology in India	3	0	0	0
3.	21147MC61C	Political and Economic Thought for a Humane Society	3	0	0	0
4.	21147MC61D	State, Nation Building and Politics in India	3	0	0	0
5.	21147MC61E	Safety in Engineering Industries	3	0	0	0

ELECTIVE –I (V SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	21153E54A	Utilization and Conservation of Electrical Energy	3	0	0	3
2.	21153E54B	Embedded System Design	3	0	0	3
3.	21153E54C	Electric Vehicle Architecture	3	0	0	3
4.	21153E54D	Energy Management and Auditing	3	0	0	3
5.	21153E54E	SMPS and UPS	3	0	0	3
6.	21153E54F	Smart System Automation	3	0	0	3

ELECTIVE – II (VSEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	21153E55A	Special Electrical Machines	3	0	0	3
2.	21153E55B	Process Modeling and Simulation	3	0	0	3
3.	21153E55C	Energy Storage Systems	3	0	0	3
4.	21153E55D	Testing of Electric Vehicles	3	0	0	3
5.	21153E55E	Non Linear Control	3	0	0	3

ELECTIVE – III (V SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	21153E56A	Embedded C- Programming	3	0	0	3
2	21153E56B	Smart Grids	3	0	0	3
3	21153E56C	Control of Power Electronics Circuits	3	0	0	3
4	21153E56D	VLSI Design	3	0	0	3
5	21153E56E	Intelligent control of Electric Vehicles	3	0	0	3
6	21153E56F	Adaptive Control	3	0	0	3
7	21153E56G	PLC Programming	3	0	0	3

ELECTIVE – IV (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	21153E64A	Power System Transients	3	0	0	3
2	21153E64B	Power Quality	3	0	0	3
3	21153E64C	Power Electronics for Renewable Energy Systems	3	0	0	3
4	21153E64D	Embedded System for Automotive Applications	3	0	0	3
5	21153E64E	Grid Integration of Electric Vehicles	3	0	0	3
6	21153E64F	Optimal Control	3	0	0	3

ELECTIVE – V (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	21153E65A	HVDC and FACTS	3	0	0	3
2	21153E65B	Electrical Drives	3	0	0	3
3	21153E65C	Embedded Control for Electrical Drives	3	0	0	3
4	21153E65D	Design of Electric Vehicle Charging System	3	0	0	3
5	21153E65E	Model Based Control	3	0	0	3
6	21153E65F	Grid integrating Techniques and Challenges	3	0	0	3

ELECTIVE – VI (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	21153E66A	Digital Signal Processing System	3	0	0	3
2	21153E66B	Under Ground Cable Engineering	3	0	0	3
3	21153E66C	Analysis of Electrical Machines	3	0	0	3
4	21153E66D	Design of Motor and Power Converters for Electric Vehicles	3	0	0	3
5	21153E66E	Hybrid Energy Technology	3	0	0	3
6	21153E66F	Computer Control of Processes	3	0	0	3

ELECTIVE – VII (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	21160S75A	Total Quality Management	3	0	0	3
2.	21160S75B	Engineering Economics and Financial Accounting	3	0	0	3
3.	21160S75C	Human Resource Management	3	0	0	3
4.	21160S75D	Knowledge Management	3	0	0	3
5.	21160S75E	Industrial Management	3	0	0	3
6.	21160S75F	Principles of Management	3	0	0	3

ELECTIVE – VIII (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	21153E76A	Substation Engineering and Substation and Substation Automation	3	0	0	3
2	21153E76B	Multilevel Power Converters	3	0	0	3
3	21153E76C	Embedded Processors	3	0	0	3
4	21153E76D	Electric Vehicle Design, Mechanics and Control	3	0	0	3
5	21153E76E	System Identification	3	0	0	3
6	21153E76F	Design and Modelling of Renewable Energy Systems	3	0	0	3

OPEN ELECTIVE I (VI SEM)

S.No	Course Code	Course Name	L	T	P	C
1	21150OE61A	IoT Concepts and Applications	2	0	2	3
2	21150OE61B	Augmented and Virtual Reality	2	0	2	3

OPEN ELECTIVE II (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	21150OE74A	Artificial Intelligence and Machine Learning Fundamentals	2	0	2	3
2	21150OE74B	Data Science Fundamentals	2	0	2	3

OPEN ELECTIVE III (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	21147OE73A	English for Competitive Examinations	3	0	0	3
2	21154OE73A	Industrial Management	3	0	0	3
3	21154OE73B	Introduction to nondestructive testing	3	0	0	3
4	21155OE73A	Remote Sensing Concepts	3	0	0	3
5	21155OE73B	Drinking Water Supply and Treatment	3	0	0	3
6	21152OE73A	Nano Technology	3	0	0	3
7	21152OE73B	Signals and Systems	3	0	0	3

OPEN ELECTIVE IV (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	21154OE74A	Additive Manufacturing	3	0	0	3
2	21154OE74B	Industrial safety	3	0	0	3
3	21155OE74A	Geographical Information System	3	0	0	3
4	21155OE74B	Basics of Integrated Water Resources Management	3	0	0	3
5	21152OE74A	Wearable devices	3	0	0	3
6	21152OE74B	Medical Informatics	3	0	0	3

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

CREDITS DISTRIBUTION

CGPA CREDITS

Semester	Core	Elective	Free Elective	Management Elective	RSD Course	Others	Total
I	21	-	-	-	-	-	21
II	26	-	-	-	-	-	26
III	27	-	-	-	-	-	27
IV	23	-	-	-	-	-	23
V	13	09	-	-	-	-	22
VI	08	09	03	-	-	-	20
VII	05	03	09	03	-	-	20
VIII	10	-	-	-	-	-	10
Over ALL Credits							169

NON CGPA CREDITS

Semester	Mandatory Course	Total
I	01	01
II	-	-
III	-	-
IV	-	-
V	01	01
VI	01	01
VII	-	-
VIII	-	-
Co curricular Activities	In-plant Training , Industrial Visit , Seminars & Conferences	-
TOTAL NON-CGPA CREDITS		03

TOTAL CREDITS	
CGPA CREDITS	169
NON-CGPA CREDITS	03
TOTAL	172

SYLLABI

21147S11

COMMUNICATIVE ENGLISH

L	T	P	C
3	0	0	

OBJECTIVES:

- || To develop the basic reading and writing skills of first year engineering and technology students.
- || To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- || To help learners develop their speaking skills and speak fluently in real contexts.
- || To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations- fixed and semi-fixed expressions

REFERENCES

- 1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
- 2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor BusinessEnglish**. Cambridge University Press, Cambridge: Reprint 2011
- 3 Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills**, Foundation Books: 2013
- 4 Means,L. Thomas and Elaine Langlois. **English & Communication For Colleges**. CengageLearning ,USA: 2007
- 5 Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005

21148S12

ENGINEERING MATHEMATICS - I

L	T	P	C
5	1	0	4

OBJECTIVES :

- 1 The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- || Use both the limit definition and rules of differentiation to differentiate functions.
- || Apply differentiation to solve maxima and minima problems.
- || Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- || Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- || Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- || Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- || Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

21149S13

ENGINEERING PHYSICS

L	T	P	C
5	1	0	4

OBJECTIVES

:

- 1 To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle -types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL : 45 PERIODS**OUTCOMES:**

Upon completion of this course,

- 1 the students will gain knowledge on the basics of properties of matter and its applications,
- 1 the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- 1 the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- 1 the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- 1 the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

21149S14

ENGINEERING CHEMISTRY**L T P C**
5 1 0 4**OBJECTIVES:**

- || To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- || To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- || Preparation, properties and applications of engineering materials.
- || Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- || Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- || The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

21154S15

ENGINEERING GRAPHICS

L T P C

5 1 0 4

OBJECTIVES:

- || To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- || To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- | familiarize with the fundamentals and standards of Engineering graphics
- | perform freehand sketching of basic geometrical constructions and multiple views of objects.
- | project orthographic projections of lines and plane surfaces.
- | draw projections and solids and development of surfaces.
- | visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

21150S16

PROBLEM SOLVING AND PYTHON PROGRAMMING**L T P C**
5 1 0 4**COURSE OBJECTIVES:**

- || To know the basics of algorithmic problem solving
- || To read and write simple Python programs.
- || To develop Python programs with conditionals and loops.
- || To define Python functions and call them.
- || To use Python data structures — lists, tuples, dictionaries.
- || To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Develop algorithmic solutions to simple computational problems
- || Read, write, execute by hand simple Python programs.
- || Structure simple Python programs for solving problems.
- || Decompose a Python program into functions.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

19150L17

**PROBLEM SOLVING AND PYTHON PROGRAMMING
LABORATORY****LT P C
0 0 3 2****COURSE OBJECTIVES:**

- || To write, test, and debug simple Python programs.
- || To implement Python programs with conditionals and loops.
- || Use functions for structuring Python programs.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Write, test, and debug simple Python programs.
- || Implement Python programs with conditionals and loops.
- || Develop Python programs step-wise by defining functions and calling them.
- || Use Python lists, tuples, dictionaries for representing compound data.
- || Read and write data from/to files in Python.

TOTAL :60 PERIODS

21149L18

PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

L T P C
0 0 3 2

OBJECTIVES:

- || To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

OUTCOMES:

Upon completion of the course, the students will be able to

TOTAL: 30 PERIODS

- || apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be**conducted) OBJECTIVES:**

- || To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- || To acquaint the students with the determination of molecular weight of a polymer by viscometry.

pol

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

- || The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30**PERIODS TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

21147S21

TECHNICAL ENGLISH

L T P C

OBJECTIVES: The Course prepares second semester engineering and Technology students to: 0 4

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary
Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-**Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;
Writing-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-
Vocabulary Development- verbal analogies **Language Development-** reported speech

TOTAL : 60 PERIODS**OUTCOMES: At the end of the course learners will be able to:**

1. Read technical texts and write area- specific texts effortlessly.
1. Listen and comprehend lectures and talks in their area of specialisation successfully.
1. Speak appropriately and effectively in varied formal and informal contexts.
1. Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

21148S22A

ENGINEERING MATHEMATICS – II

L	T	P	C
5	1	0	4

OBJECTIVES :

- || This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z^2$ – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series
 – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals
 – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

OUTCOMES :**TOTAL: 60 PERIODS**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- | Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- | Gradient, divergence and curl of a vector point function and related identities.
- | Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- | Analytic functions, conformal mapping and complex integration.
- | Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

21149S23B

PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
5	1	0	3

(Common to BME, ME, CC, ECE, EEE, E&I, ICE)

OBJECTIVES:**OBJECTIVES:**

- || To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS**9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS**9**

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS**9**

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS**9**

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO ELECTRONIC DEVICES**9**

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the students will able to

- || gain knowledge on classical and quantum electron theories, and energy band structures,
- || acquire knowledge on basics of semiconductor physics and its applications in various devices,
- || get knowledge on magnetic and dielectric properties of materials,
- || have the necessary understanding on the functioning of optical materials for optoelectronics,
- || understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding Small Systems". CRC Press, 2014

21149S24A

ENVIRONMENTAL SCIENCE AND ENGINEERING**L T P C
5 1 0 4****OBJECTIVES:**

- || To study the nature and facts about environment.
- || To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- || To study the interrelationship between living organism and environment.
- || To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- || To study the dynamic processes and understand the features of the earth's interior and surface.
- || To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- || Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- || Public awareness of environmental is at infant stage.
- || Ignorance and incomplete knowledge has lead to misconceptions
- || Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

21153S25C

CIRCUIT THEORY

L	T	P	C
5	1	0	4

OBJECTIVES:

- || To introduce electric circuits and its analysis
- || To impart knowledge on solving circuit equations using network theorems
- || To introduce the phenomenon of resonance in coupled circuits.
- || To educate on obtaining the transient response of circuits.
- || To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyse electrical circuits
- || Ability to apply circuit theorems
- || Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi,

- 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
 6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
 7. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

21154S26C

BASIC CIVIL AND MECHANICAL ENGINEERINGL T P C
5 1 0 4**OBJECTIVES:**

- || To impart basic knowledge on Civil and Mechanical Engineering.
- || To familiarize the materials and measurements used in Civil Engineering.
- || To provide the exposure on the fundamental elements of civil engineering structures.
- || To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

A – OVER VIEW**UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 10**

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society - Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING**UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 10**

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber - modern materials

UNIT III BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING**UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 15**

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system– Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES:**TOTAL: 60 PERIODS**

On successful completion of this course, the student will be able to

- || appreciate the Civil and Mechanical Engineering components of Projects.
- || explain the usage of construction material and proper selection of construction materials.
- || measure distances and area by surveying
- || identify the components used in power plant cycle.
- || demonstrate working principles of petrol and diesel engine.
- || elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd. 1999.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. ShanthaKumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.

21154L27 ENGINEERING PRACTICES LABORATORY**L T P C****0 0 3 2****OBJECTIVES:**

- || To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I****CIVIL ENGINEERING PRACTICE****13****Buildings:**

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing line sketches for water supply and sewage works. (d)

Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture. (b)

Hands-on-exercise:

Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

18

Welding:

(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding. (b)

Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning

(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:

(b) Model making – Trays and funnels. (c)

Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump

(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE**

13

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

OUTCOMES:

On successful completion of this course, the student will be able to

TOTAL: 60 PERIODS

- || fabricate carpentry components and pipe connections including plumbing works.
- || use welding equipments to join the structures.
- || Carry out the basic machining operations
- || Make the models using sheet metal works
- || Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- || Carry out basic home electrical works and appliances
- || Measure the electrical quantities
- || Elaborate on the components, gates, soldering practices.

CIVIL**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- | | | |
|---|----------|-----|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. | 15 Sets. | |
| 2. Carpentry vice (fitted to work bench) | 15 Nos. | |
| 3. Standard woodworking tools | 15 Sets. | |
| 4. Models of industrial trusses, door joints, furniture joints | 5 each | |
| 5. Power Tools: (a) Rotary Hammer | 2 Nos | |
| (b) Demolition Hammer | 2 Nos | (c) |
| Circular Saw | 2 Nos | (d) |
| Planer | 2 Nos | (e) |
| Hand Drilling Machine | 2 Nos | (f) |
| Jigsaw | 2 Nos | |

MECHANICAL

- | | |
|---|-----------|
| 1. Arc welding transformer with cables and holders | 5 Nos. |
| 2. Welding booth with exhaust facility | 5 Nos. |
| 3. Welding accessories like welding shield, chipping hammer, wire brush, etc. | 5 Sets. |
| 4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. | 2 Nos. |
| 5. Centre lathe | 2 Nos. |
| 6. Hearth furnace, anvil and smithy tools | 2 Sets. |
| 7. Moulding table, foundry tools | 2 Sets. |
| 8. Power Tool: Angle Grinder | 2 Nos |
| 9. Study-purpose items: centrifugal pump, air-conditioner | One each. |

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

21153L28C

ELECTRIC CIRCUITS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- || To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.

OUTCOMES:**TOTAL: 60 PERIODS**

- | Understand and apply circuit theorems and concepts in engineering applications.
- | Simulate electric circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
- 2 Function Generator (1 MHz) - 10 Nos.
- 3 Single Phase Energy Meter - 1 No.
- 4 Oscilloscope (20 MHz) - 10 Nos.
- 5 Digital Storage Oscilloscope (20 MHz) – 1 No.
- 6 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
- 7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
- 8 Single Phase Wattmeter – 3 Nos.
- 9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
- 10 Circuit Connection Boards - 10 Nos.Necessary Quantities of Resistors,Inductors, Capacitors of various capacities (Quarter Watt to 10Watt

21149S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

OBJECTIVES :

- || To introduce the basic concepts of PDE for solving standard partial differential equations.
- || To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- || To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- || To acquaint the student with Fourier transform techniques used in wide variety of situations.
- || To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- || Understand how to solve the given standard partial differential equations.
- || Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- || Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- || Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- || Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

21153C32

DIGITAL LOGIC CIRCUITS

L	T	P	C
3	1	0	3

OBJECTIVES:

- || To study various number systems and simplify the logical expressions using Boolean functions
- || To study combinational circuits
- || To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLDs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6+6
 Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 6+6
 Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6
 Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6+6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

OUTCOMES:
TOTAL : 60PERIODS

- || Ability to design combinational and sequential Circuits.
- || Ability to simulate using software package.
- || Ability to study various number systems and simplify the logical expressions using Boolean functions
- || Ability to design various synchronous and asynchronous circuits.
- || Ability to introduce asynchronous sequential circuits and PLDs
- || Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES

1. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
3. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
4. Charles H.Roth, Jr, Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon, 'Digital circuits and Design',Pearson Education,2016.

21153C33

ELECTROMAGNETIC THEORY

L	T	P	C
2	2	0	3

OBJECTIVES:

- || To introduce the basic mathematical concepts related to electromagnetic vector fields
- || To impart knowledge on the concepts of
 - || Electrostatic fields, electrical potential, energy density and their applications.
 - || Magneto static fields, magnetic flux density, vector potential and its applications. Different methods of emf generation and Maxwell's equations
 - || Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I 6+6

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II ELECTROSTATICS – II**6+6**

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS**6+6**

Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS**6+6**

Magnetic Circuits - Faraday’s law – Transformer and motional EMF – Displacement current - Maxwell’s equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES**6+6**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

TOTAL : 60 PERIODS**OUTCOMES:**

- || Ability to understand the basic mathematical concepts related to electromagnetic vector fields.
- || Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
- || Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
- || Ability to understand the different methods of emf generation and Maxwell’s equations
- || Ability to understand the basic concepts electromagnetic waves and characterizing parameters
- || Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, ‘Engineering Electromagnetics’, McGraw Hill Special Indian edition, 2014.
3. Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 2010

REFERENCES

1. V.V.Sarwate, ‘Electromagnetic fields and waves’, First Edition, Newage Publishers, 1993.
2. J.P.Tewari, ‘Engineering Electromagnetics - Theory, Problems and Applications’, Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, ‘Schaum’s Outline of Electromagnetics, Third Edition (Schaum’s Outline Series), McGraw Hill, 2010.
4. S.P.Ghosh, Lipika Datta, ‘Electromagnetic Field Theory’, First Edition, McGraw Hill Education(India) Private Limited, 2012.
5. K A Gangadhar, ‘Electromagnetic Field Theory’, Khanna Publishers; Eighth Reprint : 2015

21153C34**ELECTRICAL MACHINES – I**

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Magnetic-circuit analysis and introduce magnetic materials
- || Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- || Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- || Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- || Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner’s test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation- commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne’s test and Hopkinson’s test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyze the magnetic-circuits.
- || Ability to acquire the knowledge in constructional details of transformers.
- || Ability to understand the concepts of electromechanical energy conversion.
- || Ability to acquire the knowledge in working principles of DC Generator.
- || Ability to acquire the knowledge in working principles of DC Motor
- || Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., 'Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rd Edition, 2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

21153C35

ELECTRON DEVICES AND CIRCUITSL T P C
3 0 0 3**OBJECTIVES:****The student should be made to:**

- || Understand the structure of basic electronic devices.
- || Be exposed to active and passive circuit elements.
- || Familiarize the operation and applications of transistor like BJT and FET.
- || Explore the characteristics of amplifier gain and frequency response.
- || Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS AND THYRISTORS**9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

OUTCOMES:**TOTAL : 45 PERIODS**

Upon Completion of the course, the students will be able to:

- || Explain the structure and working operation of basic electronic devices.
- || Able to identify and differentiate both active and passive elements
- || Analyze the characteristics of different electronic devices such as diodes and transistors
- || Choose and adapt the required components to construct an amplifier circuit.
- || Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. . David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7th Ed., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002.
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.

21153C36

POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor (BWR)*, *Pressurized Water Reactor (PW R)*, *CANada Deuterium-Uranium reactor (CANDU)*, Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic (SPV)*, Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS

9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

OUTCOMES:**TOTAL : 45 PERIODS****Upon the completion of this course the students will be able to**

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

- Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

- El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.

2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

21153L37

ELECTRONICS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- | To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Realization of passive filters

OUTCOMES:

- | Ability to understand and analyse electronic circuits.

TOTAL: 60 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, $\pm 15V$ 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

21153L38

ELECTRICAL MACHINES LABORATORY-I

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

OUTCOMES:**TOTAL: 60 PERIODS**

- | Ability to understand and analyze DC Generator
- | Ability to understand and analyze DC Motor
- | Ability to understand and analyse Transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos

21149S41C

NUMERICAL METHODS

L	T	P	C
4	0	0	4

OBJECTIVES :

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

21153C42**ELECTRICAL MACHINES – II**

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details – Types of rotors -- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL : 60 PERIODS

OUTCOMES:

- Ability to understand the construction and working principle of Synchronous Generator
- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

21153C43

TRANSMISSION AND DISTRIBUTION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS**9**

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABILITIES 9

Underground cabilities - Types of cabilities – Construction of single core and 3 core Cabilities - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cabilities - Grading of cabilities - Power factor and heating of cabilities– DC cabilities.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin’s Law – AC and DC distributions - Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL : 45 PERIODS

OUTCOMES:

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To acquire knowledge on Underground Cabilities
- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, ‘Power System Engineering’, Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.
3. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, ‘Power System Analysis and Design’ S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffer, ‘Electrical Power Distribution and Transmission’, Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2019
4. J.Brian, Hardy and Colin R.Bayliss ‘Transmission and Distribution in Electrical Engineering’, Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, “Handbook of Electrical power Distribution,” Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, ‘Principles of power system’, S. Chand & Company Ltd, New Delhi, 2013

21153C44

MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Basic functional elements of instrumentation.
- Fundamentals of electrical and electronic instruments.
- Comparison between various measurement techniques.
- Various storage and display devices.
- Various transducers and the data acquisition systems.

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS 9

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL : 45 PERIODS**OUTCOMES:**

- To acquire knowledge on Basic functional elements of instrumentation
- To understand the concepts of Fundamentals of electrical and electronic instruments
- Ability to compare between various measurement techniques
- To acquire knowledge on Various storage and display devices
- To understand the concepts Various transducers and the data acquisition systems
- Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

UNIT V APPLICATION ICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore,"Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition,2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid,' Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

21153C46 CONTROL SYSTEMS

**L T P C
3 2 0 4**

COURSE OBJECTIVES

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To introduce stability analysis and design of compensators

UNIT I SYSTEMS AND REPRESENTATION 9
 Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9
 Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE 9
 Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications

UNIT IV STABILITY AND COMPENSATOR DESIGN 9
 Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS 9
 Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL (L: 45+T:30): 75 PERIODS

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of
 - Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers, 2017.
2. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, “Modern Control Engineering”, Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on “Control Engineering “by Prof. S. D. Agashe, IIT Bombay.

21153L47

ELECTRICAL MACHINES LABORATORY - II

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

- Regulation of three phase alternator by EMF and MMF methods.
- Regulation of three phase alternator by ZPF and ASA methods.
- Regulation of three phase salient pole alternator by slip test.
- Measurements of negative sequence and zero sequence impedance of alternators.
- V and Inverted V curves of Three Phase Synchronous Motor.
- Load test on three-phase induction motor.
- No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
- Separation of No-load losses of three-phase induction motor.
- Load test on single-phase induction motor.
- No load and blocked rotor test on single-phase induction motor.
- Study of Induction motor Starters

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines
- Ability to acquire knowledge on separation of losses

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Synchronous Induction motor 3HP – 1 No.
- DC Shunt Motor Coupled With Three phase Alternator – 4 nos
- DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
- Three Phase Induction Motor with Loading Arrangement – 2 nos
- Single Phase Induction Motor with Loading Arrangement – 2 nos
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Three Phase Auto Transformer – 3 nos
- Single Phase Resistive Loading Bank – 2 nos
- Three Phase Resistive Loading Bank – 2 nos
- Capacitor Bank – 1 No.

**21153L48 LINEAR AND DIGITAL INTEGRATED
CIRCUITS LABORATORY**

**L T P C
0 0 3 2**

OBJECTIVES:

- To learn design, testing and characterizing of circuit behavior with digital and analog ICs.

LIST OF EXPERIMENTS

- Implementation of Boolean Functions, Adder and Subtractor circuits.
- Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
- Parity generator and parity checking
- Encoders and Decoders
- Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
- Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
- Study of multiplexer and de multiplexer
- Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
- Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
- Voltage to frequency characteristics of NE/ SE 566 IC.
- Variability Voltage Regulator using IC LM317.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should have the :

- Ability to understand and implement Boolean Functions.
- Ability to understand the importance of code conversion
- Ability to Design and implement 4-bit shift registers
- Ability to acquire knowledge on Application of Op-Amp
- Ability to Design and implement counters using specific counter IC.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual ,(0-30V) variability Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	
6	Bread board	10	

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficient quantity)			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

21153C51

POWER SYSTEM ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To model the power system under steady state operating condition
- || To understand and apply iterative techniques for power flow analysis
- || To model and carry out short circuit studies on power system
- || To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off- nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to model the power system under steady state operating condition
- || Ability to understand and apply iterative techniques for power flow analysis
- || Ability to model and carry out short circuit studies on power system
- || Ability to model and analyze stability problems in power system
- | Ability to acquire knowledge on Fault analysis.
- | Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

21153C52

MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Architecture of μ P8085 & μ C 8051
- || Addressing modes & instruction set of 8085 & 8051.
- || Need & use of Interrupt structure 8085 & 8051.
- || Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR**9**

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms & I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- || Ability to need & use of Interrupt structure 8085 & 8051.
- || Ability to understand the importance of Interfacing
- || Ability to explain the architecture of Microprocessor and Microcontroller.
- || Ability to write the assembly language programme.
- || Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D. Kinley 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM," Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Edu, 2013.
4. Ajay V. Deshmukh, 'Microcontroller Theory & Applications', McGraw Hill Edu, 2016
5. Douglas V. Hall, 'Microprocessor and Interfacing', McGraw Hill Edu, 2016.

21153C53**POWER ELECTRONICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Different types of power semiconductor devices and their switching
- || Operation, characteristics and performance parameters of controlled rectifiers
- || Operation, switching techniques and basic topologies of DC-DC switching regulators.
- || Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- || Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters- performance parameters -Effect of source inductance- Firing Schemes for converter- Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy- Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters (both 120° mode and 180° mode)- Voltage & harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM - Introduction to space vector modulation -Current source inverter, Applications-Induction heating, UPS.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers-Control strategy- Power Factor Control - Multistage sequence control -single phase and three phase cyclo converters - Introduction to Matrix converters, Applications -welding .

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to analyse AC-AC and DC-DC and DC-AC converters.
- || Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCES

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal, "Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

21153C55

DIGITAL SIGNAL PROCESSING

L	T	P	C
2	2	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Signals and systems & their mathematical representation.
- || Discrete time systems.
- || Transformation techniques & their computation.
- || Filters and their design for digital implementation.
- || Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION 6+6

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 6+6

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 6+6

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.

TOTAL : 60 PERIODS**OUTCOMES:**

1. Ability to understand the importance of Fourier transform, digital filters and DS Processors.
2. Ability to acquire knowledge on Signals and systems & their mathematical representation.
3. Ability to understand and analyze the discrete time systems.
4. Ability to analyze the transformation techniques & their computation.
5. Ability to understand the types of filters and their design for digital implementation.
6. Ability to acquire knowledge on programmability digital signal processor & quantization effects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman, 'Fundamentals of Digital Signal Processing', Wiley, 2013

REFERENCES

1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L. Harris, Introduction to Digital Signal Processing using Matlab, Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. Dimitris G. Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

21153C56

OBJECT ORIENTED PROGRAMMING

L T P C
3 0 0 3

OBJECTIVES:

- || To understand Object Oriented Programming concepts and basic characteristics of Java
- || To know the principles of packages, inheritance and interfaces
- || To define exceptions and use I/O streams
- || To develop a java application with threads and generics classes
- || To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- || Develop Java programs using OOP principles
- || Develop Java programs with the concepts inheritance and interfaces
- || Build Java applications using exceptions and I/O streams
- || Develop Java applications with threads and generics classes
- || Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

21153L57

CONTROL AND INSTRUMENTATION LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges

9. Dynamics of Sensors/Transducers

(a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f) Flow

10 Power and Energy Measurement

11 Signal Conditioning

(a) Instrumentation Amplifier

(b) Analog – Digital and Digital –Analog converters (ADC and DACs)

12 Process Simulation

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand control theory and apply them to electrical engineering problems.
- || Ability to analyze the various types of converters.
- || Ability to design compensators
- || Ability to understand the basic concepts of bridge networks.
- || Ability to the basics of signal conditioning circuits.
- || Ability to study the simulation packages.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID controller simulation and learner kit – 1 No.
2. Digital storage Oscilloscope for capturing transience- 1 No
 - 2 Personal Computer with control system simulation packages - 10 Nos
3. DC motor –Generator test set-up for evaluation of motor parameters
4. CRO 30MHz – 1 No.
5. 2MHz Function Generator – 1No.
6. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
7. AC Synchro transmitter& receiver – 1No.
8. Sufficient number of Digital multi meters, speed and torque sensors

INSTRUMENTATION:

9. R, L, C Bridge kit (with manual)
10. a) Electric heater – 1No.
 Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.
 b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump – 1 No. (with necessary connecting tubes)
 c) LVDT20mm core length movability type – 1No. CRO 30MHz – 1No. d)
 Optical sensor – 1 No. Light source
 e) Strain Gauge Kit with Handy lever beam – 1No.

- 100gm weights – 10 nos
 f) Flow measurement Trainer kit – 1 No.
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter
 Voltmeter Rheostat Stop watch
 Connecting wires (3/20)
 12. IC Transistor kit – 1No.
 13. Instrumentation Amplifier kit-1 No
 14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

21153L58

**OBJECT ORIENTED PROGRAMMING
 LABORATORY**

**LT P C
 0 0 3 2**

COURSE OBJECTIVES

- 11 To build software development skills using java programming for real-world applications.
- 11 To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- 11 To develop applications using generic programming and event handling.

List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.

3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

5. Write a program to perform string operations using ArrayList. Write functions for the following

- a. Append - add at end
- b. Insert – add at particular index c.
- Search
- d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

COURSE OUTCOMES**TOTAL : 60 PERIODS**

- Upon completion of the course, the students will be able to
- || Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
 - || Develop and implement Java programs with arraylist, exception handling and multithreading .
 - || Design applications using file processing, generic programming and event handling.

21153L59**PROFESSIONAL COMMUNICATION****L T P C**
0 0 2 1**OBJECTIVES: The course aims to:**

- || Enhance the Employability and Career Skills of students
- || Orient the students towards grooming as a professional
- || Make them Employability Graduates
- || Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview –one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes.

TOTAL : 30 PERIODS**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. **Globearena**
2. **Win English**

REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

SOLID STATE DRIVES

L	T	P	C
3	0	0	3

21153C61

OBJECTIVES:

To impart knowledge on the following Topics

- || Steady state operation and transient dynamics of a motor load system.
- || Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- || Operation and performance of AC motor drives.
- || Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive- Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control- Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and suggest a converter for solid state drive.
- || Ability to select suitability drive for the given application.
- || Ability to study about the steady state operation and transient dynamics of a motor load system.
- || Ability to analyze the operation of the converter/chopper fed dc drive.
- || Ability to analyze the operation and performance of AC motor drives.
- || Ability to analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, “ Electric Drives Concepts and Applications ”, 2e, McGraw Hill, 2016

2. Shaahin Felizadeh, “Electric Machines and Drives”, CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, “Electrical Machines and Drives System,” Elsevier 2012.
4. Theodore Wildi, “ Electrical Machines ,Drives and power systems ,6th edition, Pearson Education ,2015
5. N.K. De., P.K. SEN” Electric drives” PHI, 2012.

21153C62

PROTECTION AND SWITCHGEAR

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- || Characteristics and functions of relays and protection schemes.
- || Apparatus protection, static and numerical relays
- || Functioning of circuit breaker

UNIT I PROTECTION SCHEMES 9

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS 9

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF₆, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Electromagnetic and Static Relays.
- || Ability to suggest suitability circuit breaker.
- || Ability to find the causes of abnormal operating conditions of the apparatus and system.

- || Ability to analyze the characteristics and functions of relays and protection schemes.
- || Ability to study about the apparatus protection, static and numerical relays.
- || Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age International Pvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., NewDelhi, 2009.
5. VK Metha," Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani, 'Protection and Switchgear' Oxford University Press, 2011.

21153C63

EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES

:

To impart knowledge on the following Topics

- || Building Blocks of Embedded System
- || Various Embedded Development Strategies
- || Bus Communication in processors, Input/output interfacing.
- || Various processor scheduling algorithms.
- || Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication– synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS**OUTCOMES:**

- | Ability to understand and analyze Embedded systems.
- | Ability to suggest an embedded system for a given application.
- | Ability to operate various Embedded Development Strategies
- | Ability to study about the bus Communication in processors.
- | Ability to acquire knowledge on various processor scheduling algorithms.
- | Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010
2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013
3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

21153L66

POWER ELECTRONICS AND DRIVES LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- | To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter

- 8 IGBT based three phase PWM inverter
- 9 AC Voltage controller
- 10 Switched mode power converter.
- 11 Simulation of PE circuits (1 Φ & 3 Φ semi converters, 1 Φ & 3 Φ full converters, DC-DC converters, AC voltage controllers).
- 12 Characteristics of GTO & IGCT.
- 13 Characteristics of PMBLDC motor

TOTAL: 60 PERIODS

OUTCOMES:

- || Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- || Ability to experiment about switching characteristics various switches.
- || Ability to analyze about AC to DC converter circuits.
- || Ability to analyze about DC to AC circuits.
- || Ability to acquire knowledge on AC to AC converters
- || Ability to acquire knowledge on simulation software.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Device characteristics(for SCR, MOSFET, TRIAC,GTO,IGCT and IGBT kit with built-in / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter module/Discrete Component – 2
5. IGBT based three phase PWM inverter module/Discrete Component – 2
6. Switched mode power converter module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module – 1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer – 5
12. Single phase Auto transformer –3
13. Components (Inductance, Capacitance) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tabilitys – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

21153L67

**MICROPROCESSORS AND MICROCONTROLLERS
LABORATORY****L T P C
0 0 3 2****OBJECTIVES:**

- || To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.
- || To simulate various microprocessors and microcontrollers using KEIL or Equivalent simulator.

LIST OF EXPERIMENTS

- 1 Simple arithmetic operations: addition / subtraction / multiplication / division.
- 2 Programming with control instructions:
 - (i) Ascending / Descending order, Maximum / Minimum of numbers. (ii) Programs using Rotate instructions.
 - (iii) Hex / ASCII / BCD code conversions.
- 3 Interface Experiments: with 8085
 - (i) A/D Interfacing. & D/A Interfacing.
- 4 Traffic light controller.
- 5 I/O Port / Serial communication
- 6 Programming Practices with Simulators/Emulators/open source
- 7 Read a key ,interface display
- 8 Demonstration of basic instructions with 8051 Micro controller execution, including: (i) Conditional jumps & looping
(ii) Calling subroutines.
- 9 Programming I/O Port and timer of 8051 (i) study on interface with A/D & D/A
(ii) Study on interface with DC & AC motors
- 10 Application hardware development using embedded processors.

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand and apply computing platform and software for engineering problems.
- || Ability to programming logics for code conversion.
- || Ability to acquire knowledge on A/D and D/A.
- || Ability to understand basics of serial communication.
- || Ability to understand and impart knowledge in DC and AC motor interfacing.
- || Ability to understand basics of software simulators.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power Supply	15
2.	8051 Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

21153MP68

MINI PROJECT**LT P C**
0 0 2**OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

21153C71

HIGH VOLTAGE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigriff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of capability.

OUTCOMES:**TOTAL : 45 PERIODS**

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory &Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray,' An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

21153C72

POWER SYSTEM OPERATION AND CONTROL

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following topics

- || Significance of power system operation and control.
- || Real power-frequency interaction and design of power-frequency controller.
- || Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- || Economic operation of power system.
- || SCADA and its application for real time operation and control of power systems

UNIT I PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL 9

Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation - real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to understand the day-to-day operation of electric power system.
- || Ability to analyze the control actions to be implemented on the system to meet the minute- to-minute variation of system demand.
- || Ability to understand the significance of power system operation and control.
- || Ability to acquire knowledge on real power-frequency interaction.
- || Ability to understand the reactive power-voltage interaction.
- || Ability to design SCADA and its application for real time operation

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

21153C73

RENEWABLE ENERGY SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Awareness about renewable Energy Sources and technologies.
- || Adequate inputs on a variety of issues in harnessing renewable Energy.
- || Recognize current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY 9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY 9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES 9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to create awareness about renewable Energy Sources and technologies.
- || Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- || Ability to recognize current and possible future role of renewable energy sources.
- || Ability to explain the various renewable energy resources and technologies and their applications.
- || Ability to understand basics about biomass energy.
- || Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education ,2015.

21153L77

POWER SYSTEM SIMULATION LABORATORY

L	T	P	C
00	3	2	

OBJECTIVES:

- || To provide better understanding of power system analysis through digital simulation.

LIST OF EXPERIMENTS

- 1 Computation of Transmission Line Parameters
- 2 Formation of Bus Admittance and Impedance Matrices and Solution of Networks
- 3 Power Flow Analysis using Gauss-Seidel Method
- 4 Power Flow Analysis using Newton Raphson Method
- 5 Symmetric and unsymmetrical fault analysis
- 6 Transient stability analysis of SMIB System
- 7 Economic Dispatch in Power Systems
- 8 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
- 9 State estimation: Weighted least square estimation
- 10 Electromagnetic Transients in Power Systems : Transmission Line Energization

OUTCOMES:**TOTAL: 60 PERIODS**

- || Ability to understand power system planning and operational studies.
- || Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- || Ability to analyze the power flow using GS and NR method
- || Ability to find Symmetric and Unsymmetrical fault
- || Ability to understand the economic dispatch.
- || Ability to analyze the electromagnetic transients.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Personal computers (Intel i3, 80GB, 2GBRAM) – 30 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Intel i5, 80GB, 2GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software with 5 user license
6. Compilers: C, C++, VB, VC++ - 30 users

RENEWABLE ENERGY SYSTEMS LABORATORY	L	T	P	C
	0	0	3	2

OBJECTIVES:

- || To train the students in Renewable Energy Sources and technologies.
- || To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- 1 Simulation study on Solar PV Energy System.
- 2 Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
- 3 Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
- 4 Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- 5 Simulation study on Wind Energy Generator.
- 6 Experiment on Performance assessment of micro Wind Energy Generator.
- 7 Simulation study on Hybrid (Solar-Wind) Power System.
- 8 Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- 9 Simulation study on Hydel Power.
- 10 Experiment on Performance Assessment of 100W Fuel Cell.
- 11 Simulation study on Intelligent Controllers for Hybrid Systems.

OUTCOMES:

- || Ability to understand and analyze Renewable energy systems.

TOTAL: 60 PERIODS

- || Ability to train the students in Renewable Energy Sources and technologies.
- || Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || Ability to simulate the various Renewable energy sources.
- || Ability to recognize current and possible future role of Renewable energy sources.
- || Ability to understand basics of Intelligent Controllers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the equipments / Components	Quantity Required	Remarks
1.	Personal computers (Intel i3, 80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	PV panels - 100W, 24V	1	
5.	Battery storage system with charge and discharge control 40Ah	1	
6.	PV Emulator	1	
7.	Micro Wind Energy Generator module	1	

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

21153P83PW

PROJECT WORK

L T P C

0 0 20 10

OBJECTIVES:

To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OUTCOMES:**TOTAL: 300 PERIODS**

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

21153CEC -COMPS**0 0 2 2****Electric Circuits and Fields:**

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems:

Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines:

Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems:

Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems:

Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements:

Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics:

Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives:

Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

21153E64A

ADVANCED CONTROL SYSTEML T P C
2 2 0 3**OBJECTIVES**

- i. To provide knowledge on design state feedback control and state observer.
- ii. To provide knowledge in phase plane analysis.
- iii. To give basic knowledge in describing function analysis.
- iv. To study the design of optimal controller.
- v. To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE ANALYSIS

6+6

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN

6+6

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS

6+6

Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS

6+6

Introduction, common physical nonlinearities, The phase plane method: concepts, singular points, stability of non linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL

6+6

Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

OUTCOMES:**TOTAL: 60 PERIODS**

- i. Able to design state feedback controller and state observer.
- ii. Able to understand and analyse linear and nonlinear systems using phase plane method.
- iii. Able to understand and analyse nonlinear systems using describing function method.
- iv. Able to understand and design optimal controller.
- v. Able to understand optimal estimator including Kalman Filter.
- vi. Ability to apply advanced control strategies to practical engineering problems.

TEXT BOOKS:

1. M.Gopal, "Digital Control and State Variable Methods", 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, "Modern Control Engineering", 5th Edition, Pearson, 2012.
3. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

REFERENCES:

1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Taylor and Francis Group, 2011.
3. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.

21153E64B

VISUAL LANGUAGES AND APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- 1 To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- 1 To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- 1 To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- 1 To study about the integrated development programming event driven programming, variabilitys, constants, procedures and basic ActiveX controls in visual basic.
- 1 To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I FUNDAMENTALS OF WINDOWS AND MFC 9

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective. The benefits of C++ and MFC - MFC design philosophy - Document / View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map. Drawing the lines - Curves - Ellipse - Polygons and other shapes. GDI pens - Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II RESOURCES AND CONTROLS 9

Creating a menu - Loading and displaying a menu - Responding to menu commands - Command ranges - Updating the items in menu, update ranges - Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus - Cascading menus - Context menus. The C button class - C list box class - C static class - The font view application - C edit class - C combo box class - C scrollbar class. Model dialog boxes - Modeless dialog boxes.

UNIT III DOCUMENT / VIEW ARCHITECTURE 9

The in existence function revisited - Document object - View object - Frame window object - Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document - Mid squares application - Supporting multiple document types - Alternatives to MDI. Splitter Windows: Dynamic splitter window - Static splitter windows. Creating & initializing a toolbar - Controlling the toolbar's visibility - Creating & initializing a status bar - Creating custom status bar panes - Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing - C file derivatives - Serialization basics - Writing serializability classes.

UNIT IV FUNDAMENTALS OF VISUAL BASIC 9

Menu bar - Tool bar - Project explorer - Toolbox - Properties window - Form designer - Form layout - Intermediate window. Designing the user interface: Aligning the controls - Running the application - Visual development and event driven programming.

Variabilitys: Declaration - Types - Converting variability types - User defined data types - Lifetime of a variability. Constants - Arrays - Types of arrays. Procedures: Subroutines - Functions - Calling procedures. Text box controls - List box & Combo box controls - Scroll bar and slider controls - File controls.

UNIT V DATABASE PROGRAMMING WITH VB 9

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Tablity def object, Query def object. Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

OUTCOMES:

- || Ability to understand and apply computing platform and software for engineering problems
- || Ability to study about the concepts of windows programming models.
- || Ability to study the concepts of Menu basics, menu magic and classic controls.
- || Ability to study the concept of Document/View Architecture with single & multiple document interface.
- || Ability to study about the integrated development programming event driven programming.
- || Ability to understand the database and the database management system.

TEXT BOOKS:

1. Jeff Prorise, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors (P) Ltd, Reprinted, 2002.
2. Evangelos Petroustos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFERENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, McGraw Hill, reprinted, 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', McGraw Hill, Reprinted, 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

21153E64C

DESIGN OF ELECTRICAL APPARATUS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Magnetic circuit parameters and thermal rating of various types of electrical machines.
- || Armature and field systems for D.C. machines.
- || Core, yoke, windings and cooling systems of transformers.
- || Design of stator and rotor of induction machines and synchronous machines.
- || The importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE 9

Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage – Leakage in Armature. Design of lap winding and wave winding.

UNIT II DESIGN OF TRANSFORMERS 9

Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS 9

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizing current - Short circuit current – Circle diagram - Computer program: Design of slip-ring rotor

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field MMF – Design of field winding – Design of turbo alternators -Computer program: Design of Stator main dimensions-Brushless DC Machines

OUTCOMES:**TOTAL : 45 PERIODS**

- || Ability to understand basics of design considerations for rotating and static electrical machines
- || Ability to design of field system for its application.
- || Ability to design sing and three phase transformer.
- || Ability to design armature and field of DC machines.
- || Ability to design stator and rotor of induction motor.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai& Sons, New Delhi, Fifth Edition, 1984.
2. M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Lt, 2011.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, Vikas Publishing House Private Limited, 1981.
3. V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications,2008

21153E64D

POWER SYSTEM STABILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To understand the fundamental concepts of stability of power systems and its classification.
- || To expose the students to dynamic behaviour of the power system for small and large disturbances.
- || To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY 9

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies(classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation of small-signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small-signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY 9

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY 9

Factors affecting voltage stability- Classification of Voltage stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY 9

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will attain knowledge about the stability of power system
- || Learners will have knowledge on small-signal stability, transient stability and voltage stability.
- || Learners will be able to understand the dynamic behaviour of synchronous generator for different disturbances.
- || Learners will be able to understand the various methods to enhance the stability of a power system.

TEXT BOOKS:

1. Power system stability and control ,P. Kundur ; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.
2. R.Ramnujam,” Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009
3. T.V. Cutsem and C.Vournas, “Voltage Stability of Electric Power Systems”, Kluwer publishers, 1998.

REFERENCES

- 1 Peter W., Saucer, Pai M.A., “Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.
- 2 EW. Kimbark., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 2013.
- 3 SB. Crary., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 1955.
- 4 K.N. Shubhanga, “Power System Analysis” Pearson, 2017.
- 5 Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008
- 6 Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

21153E64E

MODERN POWER CONVERTERS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Switched mode power supplies
- Matrix Converter
- Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

OUTCOMES:

- Ability to suggest converters for AC-DC conversion and SMPS

TOTAL : 45 PERIODS**TEXT BOOKS:**

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

21153E64F

INTELLECTUAL PROPERTY RIGHTS**L T P C****3 0 0 3****OBJECTIVE:**

1. To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION**9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs**10**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS**10**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW**9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs**7**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL:45 PERIODS

OUTCOME:

+ | Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

1. V. Scope Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

21153E65A

PRINCIPLES OF ROBOTICS**L T P C**
3 0 0 3**OBJ**
ECTI
VES:

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS 9

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS 9

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS 9

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING 9

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL 9

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIOD**OUTCOMES:**

- Ability to understand basic concept of robotics.
- To analyze Instrumentation systems and their applications to various
- To know about the differential motion and statics in robotics
- To know about the various path planning techniques.
- To know about the dynamics and control in robotics industries.

TEXT BOOKS:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2005.
2. John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nagel and N. G.Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. K. K.Appu Kuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, “ Embedded Systems & Robotics” – Projects using the 8051 Microcontroller”, Cengage Learning, 2009.

21153E65B**SPECIAL ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctance motors.
- Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle – Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers – Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) 9

Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- Ability to select a special Machine for a particular application.

TEXT BOOKS:

- K.Venkatratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984
- E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

21153E65C

POWER QUALITY

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Causes & Mitigation techniques of various PQ events.
- Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL 9

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS 9

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
- Ability to analyze the causes & Mitigation techniques of various PQ events.
- Ability to study about the various Active & Passive power filters.
- Ability to understand the concepts about Voltage and current distortions, harmonics.
- Ability to analyze and design the passive filters.
- Ability to acquire knowledge on compensation techniques.
- Ability to acquire knowledge on DVR.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagh, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality”, McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, “Power System Quality Assessment”, (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” Wiley, 2015.

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press), 2000.

21153E65D

EHVAC TRANSMISSION

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- EHVAC Transmission lines
- Electrostatic field of AC lines
- Corona in E.H.V. lines

UNIT I INTRODUCTION 9

EHVAC Transmission line trends and preliminary aspect - standard transmission voltages – Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

UNIT II ELECTROSTATIC FIELDS 9

Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

UNIT III POWER CONTROL 9

Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and overvoltage in EHV lines: No load voltage – Charging currents at power frequency- Voltage control – Shunt and Series compensation – Static VAR compensation.

UNIT IV CORONA EFFECTS AND RADIO INTERFERENCE 9

Corona in EHV lines – Corona loss formulae-Charge voltage diagram- Attenuation of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.

UNIT V STEADY STATE AND TRANSIENT LIMITS 9

Design of EHV lines based on steady state and transient limits - EHV capabilities and their characteristics-Introduction six phase transmission – UHV.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand the principles and types of EHVAC system.
- Ability to analyze the electrostatic field of AC lines
- Ability to study about the compensation.
- Ability to study about the corona in E.H.V. lines
- Ability to understand the EHV capabilities.
- Ability to analyze the steady state and transient limits.

TEXT BOOKS:

1. Rokosh Das Begamudre, "Extra High Voltage AC Transmission Engineering"– Wiley Eastern LTD., NEW DELHI 1990.
2. S. Rao, "HVAC and HVDC Transmission, Engineering and Practice" Khanna Publisher, Delhi, 1990.

REFERENCES

1. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India Private Limited, 2013.

2. RD Begamudre, "Extra High Voltage AC Transmission Engineering"– New Academic Science Ltd; 4 edition 2011.
3. Edison," EHV Transmission line"- Electric Institution, GEC, 1968.

21153E65E

COMMUNICATION ENGINEERING

L T P C

3 0 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the various analog and digital modulation techniques
- To study the principles behind information theory and coding
- To study the various digital communication techniques

UNIT I ANALOG MODULATION

9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNIT II PULSE MODULATION

9

Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL MODULATION AND TRANSMISSION

9

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING

9

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS

9

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

OUTCOMES:

At the end of the course, the student should be able to:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.
-

TEXT BOOKS:

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems” TMH 2007
2. S. Haykin “Digital Communications” John Wiley 2005

REFERENCES:

1

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University
2. H P Hsu, Schaum Outline Series – “Analog and Digital Communications” TMH 2006
3. B.Sklar, Digital Communications Fundamentals and Applications” 2/e Pearson Education 2007.

21153E75A

DISASTER MANAGEMENTLT P C
3 0 0 3**OBJECTIVES:**

- || To provide students an exposure to disasters, their significance and types.
- || To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- || To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- || To enhance awareness of institutional processes in the country and
- || To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS**OUTCOMES:**

The students will be able to

- || Differentiate the types of disasters, causes and their impact on environment and society
- || Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- || Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

21153E75B

HUMAN RIGHTSL T P C
3 0 0 3**OBJECTIVES :**

- || To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II

9

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III

9

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV

9

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS**OUTCOME :**

- || Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

21153E75C

OPERATIONS RESEARCH

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS 15

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS 6

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS 6

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS 10

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variability search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of this course, the students can ability to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

1. Hillier and Libeberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.

2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

21153E75D

PROBABILITY AND STATISTICS

L	T	P	C
3	0	0	3

OBJECTIVES :

- || This course aims at providing the required skill to apply the statistical tools in engineering problems.
- || To introduce the basic concepts of probability and random variables.
- || To introduce the basic concepts of two dimensional random variables.
- || To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- || To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 12

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students will be able to:

- || Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- || Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
 - || Apply the concept of testing of hypothesis for small and large samples in real life problems.
- || Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- || Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES :

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

21153E75E

FIBRE OPTICS AND LASER INSTRUMENTSL T P C
3 0 0 3**AIM**

:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

COURSE OBJECTIVES

- || To expose the students to the basic concepts of optical fibres and their properties.
- || To provide adequate knowledge about the Industrial applications of optical fibres.
- || To expose the students to the Laser fundamentals.
- || To provide adequate knowledge about Industrial application of lasers.
- || To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES**9**

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fibre: Total internal reflection, Acceptance angle (θ_a), Numerical aperture and Skew mode, –Different types of fibres and their properties: Single and multimode fibers and Step index and graded index fibers,– fibre characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses
– Dispersion – Connectors and splicers –Fibre termination – Optical sources: Light Emitting Diode (LED), – Optical detectors: PIN Diode.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES**9**

Fibre optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fibre Optic Sensor and Displacementsensor (Extrinsic Sensor) – Fibre optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS**9**

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS**9**

Laser for measurement of distance, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS**9**

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 PERIODS**COURSE OUTCOMES (COs):**

1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
3. Understand laser theory and laser generation system.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.

TEXT BOOKS:

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
3. Eric Udd, William B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists", John Wiley & Sons, 2011.

REFERENCES:

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Ready, "Industrial Applications of Lasers", Academic Press, Digitized in 2008.

4. Monte Ross, 'Laser Applications', McGraw Hill, 1968.
5. John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
6. Keiser, G., "Optical Fiber Communication", McGraw-Hill, 3rd Edition, 2000. <http://nptel.ac.in/courses/117101002/>

21153E81A**FLEXIBLE AC TRANSMISSION SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The start-of-art of the power system
- || Performance of power systems with FACTS controllers.
- || FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION 9

Real and reactive power control in electrical power transmission lines–loads & system compensation–Uncompensated transmission line–shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–TCR-FC-TCR–Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability – Steady state power transfer –Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer–enhancement of transient stability–prevention of voltage instability. SSSC–operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies– Dynamic voltage restorer(DVR).

UNIT V ADVANCED FACTS CONTROLLERS 9

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand, analyze and develop analytical model of FACTS controller for power system application.
- || Ability to understand the concepts about load compensation techniques.
- || Ability to acquire knowledge on facts devices.
- || Ability to understand the start-of-art of the power system
- || Ability to analyze the performance of steady state and transients of facts controllers.
- || Ability to study about advanced FACTS controllers.

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEE press andJohnWiley&Sons,Inc,2002.
2. NarainG. Hingorani, “Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors,Delhi-110006,2011.
3. T.J.E Miller, Power Electronics in power systems, John Wiley and sons.

REFERENCES

1. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
2. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood, HVDC and FACTS controllers—Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.

SOFT COMPUTING TECHNIQUES

L	T	P	C
3	0	0	3

21153E81B

OBJECTIVES: To impart knowledge about the following topics:

- 1. Basics of artificial neural network.
- 1. Concepts of modelling and control of neural and fuzzy control schemes.
- 1. Features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

UNIT III FUZZY SET THEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron – GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine – Case study – Familiarization with ANFIS toolbox.

TOTAL : 45 PERIODS**OUTCOMES:**

- 11 Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- 11 Ability to understand the basics of artificial neural network.
- 11 Ability to get knowledge on modelling and control of neural.

- 11 Ability to get knowledge on modelling and control of fuzzy control schemes.
- 11 Ability to acquire knowledge on hybrid control schemes.
- 11 Ability to understand the concepts of Adaptive Resonance Theory

TEXT BOOKS:

1. Laurence Fausett, "Fundamentals of Neural Networks", Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill Inc., 2000.

REFERENCES

1. Goldberg, "Genetic Algorithm in Search, Optimization and Machine learning", Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., "Neural Networks for Control", MIT press, 1992
3. Ethem Alpaydin, "Introduction to Machine learning (Adaptive Computation and Machine Learning series)", MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, "Fuzzy Modeling and Fuzzy Control Series: Control Engineering", 2006

21153E81C

POWER SYSTEMS DYNAMICS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- 11 Basics of dynamics and stability problems
- 11 Modeling of synchronous machines
- 11 Excitation system and speed-governing controllers.
- 11 Small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- 11 Transient stability simulation of multi machine power system.

UNIT I INTRODUCTION 9

Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING 9

Synchronous machine - flux linkage equations - Park's transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY 9

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL : 45 PERIODS**OUTCOMES:**

- 11 Ability to understand and analyze power system operation, stability, control and protection.
- 11 Ability to get knowledge on the basics of dynamics and stability problems
- 11 Ability to design and modelling of synchronous machines

- 11 Ability to study about excitation system and speed-governing controllers.
- 11 Ability to understand the concept of small signal stability of a single-machine infinite bus system with excitation system.
- 11 Ability to analyze the transient stability simulation.

TEXT BOOKS:

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.
2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.
3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCES

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. EI-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition, 2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International, 2007.

21153E81D**SMPS AND UPS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Modern power electronic converters and its applications in electric power utility.
- || Resonant converters and UPS

UNIT I DC-DC CONVERTERS 9

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II SWITCHED MODE POWER CONVERTERS 9

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III RESONANT CONVERTERS 9

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V POWER CONDITIONERS, UPS & FILTERS 9

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to analyze the state space model for DC – DC converters
- || Ability to acquire knowledge on switched mode power converters.
- || Ability to understand the importance of Resonant Converters.
- || Ability to analyze the PWM techniques for DC-AC converters
- || Ability to acquire knowledge on modern power electronic converters and its applications in electric power utility.
- || Ability to acquire knowledge on filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

REFERENCES

1. Philip T Krein, "Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters,

- Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
 4. Erickson, Robert W, “Fundamentals of Power Electronics”, Springer, second edition, 2010.

21153E81E	ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- 1. To study the generation, conservation of electrical power and energy efficient equipments.
- 2. To understand the principle, design of illumination systems and energy efficiency lamps.
- 3. To study the methods of industrial heating and welding.
- 4. To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS

OUTCOMES:

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

21153E81F

PROFESSIONAL ETHICS IN ENGINEERINGL T P C
3 0 0 3**OBJECTIVES:**

- || To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES**8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS**OUTCOMES:**

- 1. Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

21153E81G

PRINCIPLES OF MANAGEMENT**L T P C****3 0 0 3****OBJECTIVES:**

- 1. To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company- public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

OUTCOMES:**TOTAL: 45 PERIODS**

- 1. Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

21153E82A

ENERGY MANAGEMENT AND AUDITING

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || To impart concepts behind economic analysis and Load management.
- || Energy management on various electrical equipments and metering.
- || Concept of lighting systems and cogeneration.

UNIT I INTRODUCTION**9**

Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targeting and reporting - Energy audit process.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION**9**

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III LIGHTING SYSTEMS**9**

Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT**9**

Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS**9**

Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the basics of Energy audit process.
- || Ability to understand the basics of energy management by cogeneration
- || Ability to acquire knowledge on Energy management in lighting systems
- || Ability to impart concepts behind economic analysis and Load management.
- || Ability to understand the importance of Energy management on various electrical equipment and metering.
- || Ability to acquire knowledge on HVAC.

TEXT BOOKS:

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
5. National Productivity Council Guide Books

21153E82B**DATA STRUCTURES****L T P C
3 0 0 3****OBJECTIVES:**

- || To understand the concepts of ADTs
- || To Learn linear data structures – lists, stacks, and queues
- || To understand sorting, searching and hashing algorithms
- || To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to:

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008

21153E82C HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- 1. Planning of DC power transmission and comparison with AC power transmission.
- 2. HVDC converters.
- 3. HVDC system control.
- 4. Harmonics and design of filters.
- 5. Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy– Firing angle control– Current and extinction angle control–Starting and stopping of DC link –Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis –case study

TOTAL : 45 PERIODS

OUTCOMES:

- 1. Ability to understand the principles and types of HVDC system.
- 2. Ability to analyze and understand the concepts of HVDC converters.
- 3. Ability to acquire knowledge on DC link control.
- 4. Ability to understand the concepts of reactive power management, harmonics and

power flow analysis.

- || Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- || Ability to understand the importance of power flow in HVDC system under steady state.

TEXT BOOKS:

1. Padiyar,K.R.,“HVDC power transmission system”, New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,“High Voltage Direct Current Transmission”, Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.,“ Power System Stability and Control”, McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG,“ High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Edward Wilson Kimbark,“ Direct Current Transmission”, Vol.I, Wiley inter science, New York, London, Sydney,1971.

21153E82D

MICROCONTROLLER BASED SYSTEM DESIGN

L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- || Architecture of PIC microcontroller
- || Interrupts and timers
- || Peripheral devices for data communication and transfer
- || Functional blocks of ARM processor
- || Architecture of ARM processors

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx– Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT II INTERRUPTS AND TIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variability strings.

UNIT III PERIPHERALS AND INTERFACING 9

I²C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV INTRODUCTION TO ARM PROCESSOR 9

Architecture –ARM programmer’s model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for

Operating systems.

UNIT V ARM ORGANIZATION

9

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply computing platform and software for engineering problems.
- Ability to understand the concepts of Architecture of PIC microcontroller
- Ability to acquire knowledge on Interrupts and timers.
- Ability to understand the importance of Peripheral devices for data communication.
- Ability to understand the basics of sensor interfacing
- Ability to acquire knowledge in Architecture of ARM processors

TEXT BOOKS:

1. Peatman,J.B., “Design with PIC Micro Controllers”PearsonEducation,3rdEdition, 2004.
2. Furber,S., “ARM System on Chip Architecture” Addison Wesley trade Computer Publication, 2000.

REFERENCES

1. Mazidi, M.A.,“PIC Microcontroller” Rollin Mckinlay, Danny causey ,Prentice Hall of India, 2007.

OBJECTIVES: To impart knowledge about the following topics:

- || Smart Grid technologies, different smart meters and advanced metering infrastructure.
- || The power quality management issues in Smart Grid.
- || The high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering Infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broad band over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- || Learners will study about different Smart Grid technologies.
- || Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS:

1. Stuart Borlase "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2012.

REFERENCES

- || Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol.7, No.4, November 2011.
- || Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids, vol.14, 2012.
- || James Momohe "Smart Grid: Fundamentals of Design and Analysis", Wiley-IEEE Press, 2012.

21153E82F BIOMEDICAL INSTRUMENTATION**L T P C
3 0 0 3****OBJECTIVES:**

- || To Introduce Fundamentals of Biomedical Engineering
- || To study the communication mechanics in a biomedical system with few examples
- || To study measurement of certain important electrical and non-electrical parameters

- || To understand the basic principles in imaging techniques
- || To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS

OUTCOMES: At the end of the course students will have the

- || Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- || Ability to provide latest ideas on devices of non-electrical devices.
- || Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- || Ability to understand the analysis systems of various organ types.
- || Ability to bring out the important and modern methods of imaging techniques and their analysis.
- || Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John

Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

21153E82G

FUNDAMENTALS OF NANOSCIENCE

L T P C

3 0 0 3

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS

7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

- | | Will familiarize about the science of nanomaterials
- | | Will demonstrate the preparation of nanomaterials
- | | Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, “The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.



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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING

PROGRAM HANDBOOK

B.TECH FULLTIME
ELECTRICAL & ELECTRONICS ENGINEERING

[REGULATION 2020]

[for candidates admitted to B.Tech EEE program from June 2020 onwards]

Skill Development

Employability

Entrepreneurship

COURSE STRUCTURE

B.TECH-EEE R 2020

B.TECH (FT) EEE [REGULATION 2020]

SEMESTER I

S.No	Course Code	Course Name	L	T	P	C
1	20147S11	Communicative English	2	0	0	2
2	20148S12	Engineering Mathematics-I	3	1	0	4
3	20149S13	Engineering Physics	2	1	0	3
4	20149S14	Engineering Chemistry	2	1	0	3
5	20154S15	Engineering Graphics	1	0	4	3
6	20150S16	Problem Solving and Basics of Python programming	3	0	0	3
PRACTICAL						
7	20150L17	Problem Solving and Basics of Python programming Laboratory	0	0	4	2
8	20149L18	Physics and Chemistry Laboratory	0	0	4	2
TOTAL CREDITS						22
AUDIT COURSE						
9	201AGIT	Induction Training Programme				2

SEMESTER II

S.No	Course Code	Course Name	L	T	P	C
1	20147S21	Technical English	2	0	0	2
2	20148S22	Engineering Mathematics –II	3	1	0	4
3	20149S23B	Physics for Electronics Engineering	3	0	0	3
4	20149S24A	Environmental Science and Engineering	3	0	0	3
5	20153S25C	Circuit Theory	2	1	0	3
6	20154S26C	Basic Civil and Mechanical Engineering	4	0	0	4
PRACTICAL						
7	20154L27	Engineering Practices Laboratory	1	0	4	3
8	20153L28C	Electric Circuits Laboratory	0	0	4	2
TOTAL CREDITS						24
AUDIT COURSE						
1	201AGIC	Indian Constitution				2
SOFT SKILL COURSE						
2	201ASBE	Basic Behavioral Etiquette				2

SEMESTER III

S.No	Course Code	Course Name	L	T	P	C
1	20148S31C	Transforms and Partial Differential Equations	3	1	0	4
2	20153S32	Digital Logic Circuits	2	2	0	3
3	20153C33	Electromagnetic Theory	2	2	0	3
4	20153C34	Electrical Machines-I	2	2	0	3
5	20153C35	Electron Devices and Circuits	3	0	0	3
6	20153C36	Power Plant Engineering	3	0	0	3
PRACTICAL						
7	20153L37	Electronics Laboratory	0	0	4	2
8	20153L38	Electrical Machines Laboratory-I	0	0	4	2
9	201AGGS	Introduction to Gender studies				2
TOTAL CREDITS						23

SEMESTER IV

S.No	Course Code	Course Name	L	T	P	C
1	20148S41C	Numerical Methods	3	1	0	4
2	20153C42	Electrical Machines –II	2	2	0	3
3	20153C43	Transmission and Distribution	3	0	0	3
4	20153C44	Measurements and Instrumentation	3	0	0	3
5	20153C45	Linear Integrated Circuits and Applications	3	0	0	3
6	20153C46	Control Systems	3	2	0	4
PRACTICAL						
7	20153L47	Electrical Machines Laboratory-II	0	0	4	2
8	20153L48	Linear and Digital Integrated Circuits Laboratory	0	0	4	2
9	20153L49	Technical Seminar	0	0	2	1
10	201AGCE	Community Engagement				2
11	201ASGS	Technical, General Aptitude and Skill set Development				2
TOTAL CREDITS						25

SEMESTER V

S.No	Course Code	Course Name	L	T	P	C
1	20153C51	Power System Analysis	3	0	0	3
2	20153C52	Microprocessors and Microcontrollers	3	0	0	3
3	20153C53	Power Electronics	3	0	0	3
4	201_OE54_	OPEN Elective-I	3	0	0	3
5	20153S55	Digital Signal Processing	2	2	0	3
6	20153S56	Object Oriented Programming	3	0	0	3
PRACTICAL						
7	20153L57	Control and Instrumentation Laboratory	0	0	4	2
8	20153L58	Object Oriented Programming Laboratory	0	0	4	2
9	20153L59	Professional Communication	0	0	2	1
RESEARCH SKILL DEVELOPMENT(RSD)COURSE						
10	201AGIE	Innovation and Entrepreneurship				2
TOTAL CREDITS						23

SEMESTER –VI

S.No	Course Code	Course Name	L	T	P	C
1	20153C61	Solid State Drives	3	0	0	3
2	20153C62	Protection and Switchgear	3	0	0	3
3	20153S63	Embedded Systems	3	0	0	3
4	20153E64_	Elective –I	3	0	0	3
5	20153E65_	Elective –II	3	0	0	3
PRACTICAL						
6	20153L66	Power Electronics and Drives Laboratory	0	0	4	2
7	20153L67	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8	20153MP68	Mini Project	-	-	4	2
RESEARCH SKILL DEVELOPMENT (RSD) COURSE						
9	201ASTT	Technical Training				2
TOTAL CREDITS						21

SEMESTER –VII

S.No	Course Code	Course Name	L	T	P	C
1	20153C71	High Voltage Engineering	3	0	0	3
2	20153C72	Power System Operation and Control	3	0	0	3
3	20153C73	Renewable Energy Systems	3	0	0	3
4	201_OE74_	OPEN Elective –II	3	0	0	3
5	20153E75_	Elective –III	3	0	0	3
6	20153E76_	Elective –IV	3	0	0	3
PRACTICAL						
7	20153L77	Power System Simulation Laboratory	0	0	4	2
8	20153L78	Renewable Energy Systems Laboratory	0	0	4	2
TOTAL CREDITS						22

SEMESTER –VIII

S.No	Course Code	Course Name	L	T	P	C
1	20153E81_	Elective –V	3	0	0	3
2.	20153E82_	Elective –VI	3	0	0	3
PRACTICAL						
3.	20153P83	Project Work	0	0	12	6
4.	201AGPE	Professional Ethics and Human Values				2
5.	201ASIM	Interview Skills Training and Mock Test				2
TOTAL CREDITS						12
TOTAL NO.OF CREDITS=172						

** - Experiential based learning courses (Theory)

- Highly Significant Laboratory Courses (Practical)

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LIST OF ELECTIVES

ELECTIVE –I (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E64A	Advanced Control System	3	0	0	3
2.	20153E64B	Visual Languages and Applications	3	0	0	3
3.	20153E64C	Design of Electrical Apparatus	3	0	0	3
4.	20153E64D	Power Systems Stability	3	0	0	3
5.	20153E64E	Modern Power Converters	3	0	0	3
6.	20153E64F	Intellectual Property Rights	3	0	0	3

ELECTIVE–II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E65A	Principles of Robotics	3	0	0	3
2.	20153E65B	Special Electrical Machines	3	0	0	3
3.	20153E65C	Power Quality	3	0	0	3
4.	20153E65D	EHVAC Transmission	3	0	0	3
5.	20153E65E	Communication Engineering	3	0	0	3

ELECTIVE –III (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	20153E75A	Disaster Management	3	0	0	3
2	20153E75B	Human Rights	3	0	0	3
3	20153E75C	Operations Research	3	0	0	3
4	20153E75D	Probability and Statistics	3	0	0	3
5.	20153E75E	Fiber Optics and Laser Instrumentation	3	0	0	3

ELECTIVE –IV (VII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E76A	System Identification and Adaptive Control	3	0	0	3
2.	20153E76B	Computer Architecture	3	0	0	3
3.	20153E76C	Control of Electrical Drives	3	0	0	3
4.	20153E76D	VLSI Design	3	0	0	3
5.	20153E76E	Power Systems Transients	3	0	0	3
6.	20153E76F	Total Quality Management	3	0	0	3

ELECTIVE –V (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E81A	Flexible AC Transmission Systems	3	0	0	3
2.	20153E81B	Soft Computing Techniques	3	0	0	3
3.	20153E81C	Power Systems Dynamics	3	0	0	3
4.	20153E81D	SMPS and UPS	3	0	0	3
5.	20153E81E	Electric Energy Generation, Utilization and Conservation	3	0	0	3
6.	20153E81F	Professional Ethics in Engineering	3	0	0	3
7.	20153E81G	Principles of Management	3	0	0	3

ELECTIVE –VI (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	20153E82A	Energy Management and Auditing	3	0	0	3
2.	20153E82B	Data Structures	3	0	0	3
3.	20153E82C	High Voltage Direct Current Transmission	3	0	0	3
4.	20153E82D	Microcontroller Based System Design	3	0	0	3
5.	20153E82E	Smart Grid	3	0	0	3
6.	20153E82F	Biomedical Instrumentation	3	0	0	3
7.	20153E82G	Fundamentals of Nano Science	3	0	0	3

FREE ELECTIVE (V SEM)

S.No	Course Code	Course Name	L	T	P	C
1	20150FE54A	Database Management System	3	0	0	3
2	20152FE54A	Basics of Biomedical Instrumentation	3	0	0	3
3	20154FE54A	Renewable Energy Sources	3	0	0	3
4	20155FE54A	Air Pollution and Control Engineering	3	0	0	3
5	20150FE54B	Cloud computing	3	0	0	3
6	20152FE54B	Sensors and Transducers	3	0	0	3
7	20154FE54B	Automatic System	3	0	0	3
8	20155FE54B	Geographic Information System	3	0	0	3

FREE ELECTIVE (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	20150FE74A	Introduction to C Programming	3	0	0	3
2	20152FE74A	Robotics	3	0	0	3
3	20154FE74A	Industrial safety	3	0	0	3
4	20155FE74A	Green Building Design	3	0	0	3
5	20150FE74B	Datastructures and Algorithms	3	0	0	3
6	20152FE74B	Electronic Devices	3	0	0	3
7	20154FE74B	Testing of Materials	3	0	0	3
8	20155FE74B	Waste water Treatment	3	0	0	3

20147S11

COMMUNICATIVE ENGLISH

L	T	P	C
5	1	0	4

OBJECTIVES:

- || To develop the basic reading and writing skills of first year engineering and technology students.
- || To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- || To help learners develop their speaking skills and speak fluently in real contexts.
- || To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development-** Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development--** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns-direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading –**Writing-** brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Language development-**modal verbs- present/ past perfect tense - **Vocabulary development-**collocations- fixed and semi-fixed expressions

REFERENCES

- 1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
- 2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor BusinessEnglish**. Cambridge University Press, Cambridge: Reprint 2011
- 3 Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills**, Foundation Books: 2013
- 4 Means,L. Thomas and Elaine Langlois. **English & Communication For Colleges**. CengageLearning ,USA: 2007
- 5 Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005

20148S12

ENGINEERING MATHEMATICS - I

L	T	P	C
5	1	0	4

OBJECTIVES :

- || The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS

12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS

12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS

12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS

12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- || Use both the limit definition and rules of differentiation to differentiate functions.
- || Apply differentiation to solve maxima and minima problems.
- || Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- || Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- || Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- || Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- || Apply various techniques in solving differential equations.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

20149S13

ENGINEERING PHYSICS

L	T	P	C
5	1	0	4

OBJECTIVES

:

- || To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER**9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS**9**

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle -types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS**9**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS**9**

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS**9**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL : 45 PERIODS**OUTCOMES:**

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- || the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- || the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

20149S14

ENGINEERING CHEMISTRY**L T P C**
5 1 0 4**OBJECTIVES:**

- || To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- || To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- || Preparation, properties and applications of engineering materials.
- || Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- || Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT**9**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS**9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE**9**

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION**9**

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES**9**

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- || The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

20154S15

ENGINEERING GRAPHICS**L T P C**
5 1 0 4**OBJECTIVES:**

- || To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- || To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE**6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS**5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- | familiarize with the fundamentals and standards of Engineering graphics
- | perform freehand sketching of basic geometrical constructions and multiple views of objects.
- | project orthographic projections of lines and plane surfaces.
- | draw projections and solids and development of surfaces.
- | visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. S. M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

20150S16

PROBLEM SOLVING AND PYTHON PROGRAMMING**L T P C**
5 1 0 4**COURSE OBJECTIVES:**

- || To know the basics of algorithmic problem solving
- || To read and write simple Python programs.
- || To develop Python programs with conditionals and loops.
- || To define Python functions and call them.
- || To use Python data structures -- lists, tuples, dictionaries.
- || To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:**Upon completion of the course, students will be able to**

- || Develop algorithmic solutions to simple computational problems
- || Read, write, execute by hand simple Python programs.
- || Structure simple Python programs for solving problems.
- || Decompose a Python program into functions.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,, 2015.

20150L17

**PROBLEM SOLVING AND PYTHON PROGRAMMING
LABORATORY****L T P C
0 0 3 2****COURSE OBJECTIVES:**

- || To write, test, and debug simple Python programs.
- || To implement Python programs with conditionals and loops.
- || Use functions for structuring Python programs.
- || Represent compound data using Python lists, tuples, dictionaries.
- || Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- || Write, test, and debug simple Python programs.
- || Implement Python programs with conditionals and loops.
- || Develop Python programs step-wise by defining functions and calling them.
- || Use Python lists, tuples, dictionaries for representing compound data.
- || Read and write data from/to files in Python.

TOTAL :60 PERIODS

20149L18

PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

L T P C
0 0 3 2

OBJECTIVES:

- || To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

OUTCOMES:

Upon completion of the course, the students will be able to

TOTAL: 30 PERIODS

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be**conducted) OBJECTIVES:**

- || To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- || To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

- || The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30**PERIODS TEXTBOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

20147S21

TECHNICAL ENGLISH**L T P C****OBJECTIVES: The Course prepares second semester engineering and Technology students to: 0 4**

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary
Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-**Writing-** interpreting charts, graphs- **Vocabulary Development-**vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;
Writing-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-
Vocabulary Development- verbal analogies **Language Development-** reported speech

TOTAL : 60 PERIODS**OUTCOMES: At the end of the course learners will be able to:**

- || Read technical texts and write area- specific texts effortlessly.
- || Listen and comprehend lectures and talks in their area of specialisation successfully.
- || Speak appropriately and effectively in varied formal and informal contexts.
- || Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

20148S22A

ENGINEERING MATHEMATICS – II

L	T	P	C
5	1	0	4

OBJECTIVES :

- || This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES**12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS**12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS**12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c, cz, \frac{1}{z}, z^2$ – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series
 – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals
 – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

OUTCOMES :**TOTAL: 60 PERIODS**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
 - | Gradient, divergence and curl of a vector point function and related identities.
 - | Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
 - | Analytic functions, conformal mapping and complex integration.
 - | Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

20149S23B

PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
5	1	0	3

(Common to BME, ME, CC, ECE, EEE, E&I, ICE)

OBJECTIVES:**OBJECTIVES:**

- || To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field –Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANO-ELECTRONIC DEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course, the students will able to

- || gain knowledge on classical and quantum electron theories, and energy band structures,
- || acquire knowledge on basics of semiconductor physics and its applications in various devices,
- || get knowledge on magnetic and dielectric properties of materials,
- || have the necessary understanding on the functioning of optical materials for optoelectronics,
- || understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: Understanding Small Systems". CRC Press, 2014

20149S24A

ENVIRONMENTAL SCIENCE AND ENGINEERING

L T P C
5 1 0 4**OBJECTIVES:**

- || To study the nature and facts about environment.
- || To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- || To study the interrelationship between living organism and environment.
- || To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- || To study the dynamic processes and understand the features of the earth's interior and surface.
- || To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION

8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- || Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- || Public awareness of environmental is at infant stage.
- || Ignorance and incomplete knowledge has lead to misconceptions
- || Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

20153S25C

CIRCUIT THEORY

L	T	P	C
5	1	0	4

OBJECTIVES:

- || To introduce electric circuits and its analysis
- || To impart knowledge on solving circuit equations using network theorems
- || To introduce the phenomenon of resonance in coupled circuits.
- || To educate on obtaining the transient response of circuits.
- || To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC IRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyse electrical circuits
- || Ability to apply circuit theorems
- || Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi,

- 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
 6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
 7. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

20154S26C

BASIC CIVIL AND MECHANICAL ENGINEERING

L T P C

5 1 0 4

OBJECTIVES:

- || To impart basic knowledge on Civil and Mechanical Engineering.
- || To familiarize the materials and measurements used in Civil Engineering.
- || To provide the exposure on the fundamental elements of civil engineering structures.
- || To enable the students to distinguish the components and working principle of power plant units, IC engines, and R & AC system.

A – OVER VIEW**UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING****10****Overview of Civil Engineering** - Civil Engineering contributions to the welfare of Society –

Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society

–Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING**UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS****10****Surveying:** Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.**Civil Engineering Materials:**Bricks – stones – sand – cement – concrete – steel - timber - modern materials**UNIT III BUILDING COMPONENTS AND STRUCTURES****15****Foundations:** Types of foundations - Bearing capacity and settlement – Requirement of good foundations.**Civil Engineering Structures:** Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING**UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS****15**

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants – working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM**10**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system– Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES:**TOTAL: 60 PERIODS**

On successful completion of this course, the student will be able to

- | appreciate the Civil and Mechanical Engineering components of Projects.
- | explain the usage of construction material and proper selection of construction materials.
- | measure distances and area by surveying
- | identify the components used in power plant cycle.
- | demonstrate working principles of petrol and diesel engine.
- | elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd. 1999.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. ShanthaKumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.

20154L27**ENGINEERING PRACTICES LABORATORY****L T P C****0 0 3 2****OBJECTIVES:**

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE****13****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works. (d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture. (b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE**18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays and funnels. (c) Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE**16**

1. Study of Electronic components and equipments – Resistor, colour coding of AC signal parameter (peak-peak, rms period, frequency) using CR. measurement
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

OUTCOMES:

On successful completion of this course, the student will be able to

TOTAL: 60 PERIODS

- || fabricate carpentry components and pipe connections including plumbing works.
- || use welding equipments to join the structures.
- || Carry out the basic machining operations
- || Make the models using sheet metal works
- || Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- || Carry out basic home electrical works and appliances
- || Measure the electrical quantities
- || Elaborate on the components, gates, soldering practices.

CIVIL**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.	
2. Carpentry vice (fitted to work bench)	15 Nos.	
3. Standard woodworking tools	15 Sets.	
4. Models of industrial trusses, door joints, furniture joints	5 each	
5. Power Tools: (a) Rotary Hammer	2 Nos	
(b) Demolition Hammer	2 Nos	(c)
Circular Saw	2 Nos	(d)
Planer	2 Nos	(e)
Hand Drilling Machine	2 Nos	(f)
Jigsaw	2 Nos	

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. purpose items: Iron box, fan and regulator, emergency lamp	Study 1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

20153L28C**ELECTRIC CIRCUITS LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- || To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star, delta networks circuits.

OUTCOMES:**TOTAL: 60 PERIODS**

- | Understand and apply circuit theorems and concepts in engineering applications.
- | Simulate electric circuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- 1 Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
- 2 Function Generator (1 MHz) - 10 Nos.
- 3 Single Phase Energy Meter - 1 No.
- 4 Oscilloscope (20 MHz) 10 Nos.

- 5 Digital Storage Oscilloscope (20 MHz) – 1 No.
- 6 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
- 7 AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
- 8 Single Phase Wattmeter – 3 Nos.
- 9 Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
- 10 Circuit Connection Boards - 10 Nos.Necessary Quantities of Resistors,Inductors, Capacitors of various capacities (Quarter Watt to 10Watt

20149S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

OBJECTIVES :

- || To introduce the basic concepts of PDE for solving standard partial differential equations.
- || To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- || To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- || To acquaint the student with Fourier transform techniques used in wide variety of situations.
- || To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS**12**

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES**12**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**12**

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS**12**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS**12**

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- || Understand how to solve the given standard partial differential equations.
- || Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- || Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- ☐ Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- ☐ Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

20153C32**DIGITAL LOGIC CIRCUITS**

L	T	P	C
3	1	0	3

OBJECTIVES:

- To study various number systems and simplify the logical expressions using Boolean functions
- To study combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLDs
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I	NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES	6+6
Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.		

UNIT II	COMBINATIONAL CIRCUITS	6+6
Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.		

UNIT III	SYNCHRONOUS SEQUENTIAL CIRCUITS	6+6
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.		

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits- introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6+6
RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

OUTCOMES:**TOTAL : 60PERIODS**

- | Ability to design combinational and sequential Circuits.
- | Ability to simulate using software package.
- | Ability to study various number systems and simplify the logical expressions using Boolean functions
- | Ability to design various synchronous and asynchronous circuits.
- | Ability to introduce asynchronous sequential circuits and PLDs
- | Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES

1. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 2013.
3. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
4. Charles H.Roth, Jr, Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon, 'Digital circuits and Design',Pearson Education, 2016.

20153C33

ELECTROMAGNETIC THEORY

L	T	P	C
2	2	0	3

OBJECTIVES:

- | To introduce the basic mathematical concepts related to electromagnetic vector fields
- | To impart knowledge on the concepts of
 - | Electrostatic fields, electrical potential, energy density and their applications.
 - | Magneto static fields, magnetic flux density, vector potential and its applications. | Different methods of emf generation and Maxwell's equations
 - | Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I 6+6

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II ELECTROSTATICS – II**6+6**

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS**6+6**

Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS**6+6**

Magnetic Circuits - Faraday’s law – Transformer and motional EMF – Displacement current - Maxwell’s equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES**6+6**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

TOTAL : 60 PERIODS**OUTCOMES:**

- || Ability to understand the basic mathematical concepts related to electromagnetic vector fields.
- || Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
- || Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
- || Ability to understand the different methods of emf generation and Maxwell’s equations
- || Ability to understand the basic concepts electromagnetic waves and characterizing parameters
- || Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, ‘Engineering Electromagnetics’, McGraw Hill Special Indian edition, 2014.
3. Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 2010

REFERENCES

1. V.V.Sarwate, ‘Electromagnetic fields and waves’, First Edition, Newage Publishers, 1993.
2. J.P.Tewari, ‘Engineering Electromagnetics - Theory, Problems and Applications’, Second Edition, Khanna Publishers.
3. Joseph. A.Edminister, ‘Schaum’s Outline of Electromagnetics, Third Edition (Schaum’s Outline Series), McGraw Hill, 2010.
4. S.P.Ghosh, Lipika Datta, ‘Electromagnetic Field Theory’, First Edition, McGraw Hill Education(India) Private Limited, 2012.
5. K A Gangadhar, ‘Electromagnetic Field Theory’, Khanna Publishers; Eighth Reprint : 2015

20153C34

ELECTRICAL MACHINES – I

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Magnetic-circuit analysis and introduce magnetic materials
- || Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- || Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- || Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- || Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation- commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne's test and Hopkinson's test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:**TOTAL : 60 PERIODS**

- || Ability to analyze the magnetic-circuits.
- || Ability to acquire the knowledge in constructional details of transformers.
- || Ability to understand the concepts of electromechanical energy conversion.
- || Ability to acquire the knowledge in working principles of DC Generator.
- || Ability to acquire the knowledge in working principles of DC Motor
- || Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., 'Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rd Edition, 2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

20153C35**ELECTRON DEVICES AND CIRCUITS****L T P C
3 0 0 3****OBJECTIVES:****The student should be made to:**

- || Understand the structure of basic electronic devices.
- || Be exposed to active and passive circuit elements.
- || Familiarize the operation and applications of transistor like BJT and FET.
- || Explore the characteristics of amplifier gain and frequency response.
- || Learn the required functionality of positive and negative feedback systems.

UNIT I PN JUNCTION DEVICES**9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS AND THYRISTORS**9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS**9**

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER**9**

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS**9**

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

OUTCOMES:**TOTAL : 45 PERIODS****Upon Completion of the course, the students will be able to:**

- || Explain the structure and working operation of basic electronic devices.
- || Able to identify and differentiate both active and passive elements
- || Analyze the characteristics of different electronic devices such as diodes and transistors
- || Choose and adapt the required components to construct an amplifier circuit.
- || Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:

1. . David A. Bell ,”Electronic devices and circuits”, Oxford University higher education, 5th edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7th Ed., Oxford University Press

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2020.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, “Electronic devices and circuit theory”, 2002.
5. Robert B. Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.

20153C36

POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : *Boiling Water Reactor* (BWR), *Pressurized Water Reactor* (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar Photo Voltaic* (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS

9
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

OUTCOMES:**TOTAL : 45 PERIODS****Upon the completion of this course the students will be able to**

- CO1 Explain the layout, construction and working of the components inside a thermal power plant.
- CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- CO3 Explain the layout, construction and working of the components inside nuclear power plants.
- CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
- CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

- Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

- El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.

2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

20153L37**ELECTRONICS LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Realization of passive filters

OUTCOMES:

- Ability to understand and analyse electronic circuits.

TOTAL: 60 PERIODS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, $\pm 15V$ 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

20153L38

ELECTRICAL MACHINES LABORATORY-I

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS

- Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
- Load characteristics of DC compound generator with differential and cumulative connections.
- Load test on DC shunt motor.
- Load test on DC compound motor.
- Load test on DC series motor.
- Swinburne's test and speed control of DC shunt motor.
- Hopkinson's test on DC motor – generator set.
- Load test on single-phase transformer and three phase transformers.
- Open circuit and short circuit tests on single phase transformer.
- Sumpner's test on single phase transformers.
- Separation of no-load losses in single phase transformer.
- Study of starters and 3-phase transformers connections.

OUTCOMES:**TOTAL: 60 PERIODS**

- Ability to understand and analyze DC Generator
- Ability to understand and analyze DC Motor
- Ability to understand and analyse Transformers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- DC Shunt Motor with Loading Arrangement – 3 nos
- DC Shunt Motor Coupled with Three phase Alternator – 1 No.
- Single Phase Transformer – 4 nos
- DC Series Motor with Loading Arrangement – 1 No.
- DC compound Motor with Loading Arrangement – 1 No.
- Three Phase Induction Motor with Loading Arrangement – 2 nos
- Single Phase Induction Motor with Loading Arrangement – 1 No.
- DC Shunt Motor Coupled With DC Compound Generator – 2 nos
- DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Three Phase Auto Transformer – 1 No.
- Single Phase Resistive Loading Bank – 2 nos
- Three Phase Resistive Loading Bank. – 2 nos

20149S41C

NUMERICAL METHODS

L	T	P	C
4	0	0	4

OBJECTIVES :

- ✓ To introduce the basic concepts of solving algebraic and transcendental equations.
- ✓ To introduce the numerical techniques of interpolation in various intervals in real life situations.
- ✓ To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- ✓ To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- ✓ To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students should be able to:

- ✓ Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- ✓ Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- ✓ Apply the numerical techniques of differentiation and integration for engineering problems.
- ✓ Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- ✓ Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

20153C42

ELECTRICAL MACHINES – II

L	T	P	C
2	2	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details – Types of rotors – Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL : 60 PERIODS

OUTCOMES:

- Ability to understand the construction and working principle of Synchronous Generator
- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.
- Ability to understand the construction and working principle of Three phase Induction Motor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

20153C43

TRANSMISSION AND DISTRIBUTION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS**9**

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABILITIES 9

Underground cabilitys - Types of cabilitys – Construction of single core and 3 core Cabilitys - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cabilitys - Grading of cabilitys - Power factor and heating of cabilitys– DC cabilitys.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin’s Law – AC and DC distributions - Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To acquire knowledge on Underground Cabilitys
- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, ‘Power System Engineering’, Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.
3. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, ‘Power System Analysis and Design’ S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffe, ‘Electrical Power Distribution and Transmission’, Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss ‘Transmission and Distribution in Electrical Engineering’, Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, “Handbook of Electrical power Distribution,” Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, ‘Principles of power system’, S. Chand & Company Ltd, New Delhi, 2013

20153C44

MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Basic functional elements of instrumentation
- Fundamentals of electrical and electronic instruments
- Comparison between various measurement techniques
- Various storage and display devices
- Various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration- Principle and types of analog and digital voltmeters, ammeters.

UNIT II ELECTRICAL AND ELECTRONIC INSTRUMENTS 9

Principle and types of multi meters – Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – Smart sensors-Thermal Imagers.

TOTAL : 45 PERIODS**OUTCOMES:**

- To acquire knowledge on Basic functional elements of instrumentation
- To understand the concepts of Fundamentals of electrical and electronic instruments
- Ability to compare between various measurement techniques
- To acquire knowledge on Various storage and display devices
- To understand the concepts Various transducers and the data acquisition systems
- Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

UNIT V APPLICATION ICs**9**

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS**OUTCOMES:**

- ✓ Ability to acquire knowledge in IC fabrication procedure
- ✓ Ability to analyze the characteristics of Op-Amp
- ✓ To understand the importance of Signal analysis using Op-amp based circuits.
- ✓ Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- ✓ To understand and acquire knowledge on the Applications of Op-amp
- ✓ Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla, "Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

20153C46**CONTROL SYSTEMS****LT P C****3 2 0 4****COURSE OBJECTIVES**

- ✓ To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- ✓ To provide adequate knowledge in the time response of systems and steady state error analysis.
- ✓ To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- ✓ To introduce stability analysis and design of compensators

UNIT I	SYSTEMS AND REPRESENTATION	9
Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.		
UNIT II	TIME RESPONSE	9
Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.		
UNIT III	FREQUENCY RESPONSE	9
Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications		
UNIT IV	STABILITY AND COMPENSATOR DESIGN	9
Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensator using bode plots.		
UNIT V	STATE VARIABLE ANALYSIS	9
Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.		
TOTAL (L: 45+T:30): 75 PERIODS		

COURSE OUTCOMES

At the end of the course, the student should have the :

- ✓ Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
- ✓ Ability to do time domain and frequency domain analysis of various models of linear system.
- ✓ Ability to interpret characteristics of the system to develop mathematical model.
- ✓ Ability to design appropriate compensator for the given specifications.
- ✓ Ability to come out with solution for complex control problem.
- ✓ Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., “Control Systems Engineering”, New Age International Publishers, 2017.
2. Benjamin C. Kuo, “Automatic Control Systems”, Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, “Modern Control Engineering”, Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., “Modern Control Systems”, Pearson Education, 2009.
3. John J.D., Azzo Constantine, H. and Houpis Stuart, N Sheldon, “Linear Control System Analysis and Design with MATLAB”, CRC Taylor & Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and Control of Engineers”, Narosa Publishing House, 2017.
5. M.Gopal, “Control System: Principle and design”, McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on “Control Engineering “by Prof. S. D. Agashe, IIT Bombay.

20153L47

ELECTRICAL MACHINES LABORATORY - II

L	T	P	C
0	0	3	2

OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

- Regulation of three phase alternator by EMF and MMF methods.
- Regulation of three phase alternator by ZPF and ASA methods.
- Regulation of three phase salient pole alternator by slip test.
- Measurements of negative sequence and zero sequence impedance of alternators.
- V and Inverted V curves of Three Phase Synchronous Motor.
- Load test on three-phase induction motor.
- No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
- Separation of No-load losses of three-phase induction motor.
- Load test on single-phase induction motor.
- No load and blocked rotor test on single-phase induction motor.
- Study of Induction motor Starters

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and analyze EMF and MMF methods
- Ability to analyze the characteristics of V and Inverted V curves
- Ability to understand the importance of Synchronous machines
- Ability to understand the importance of Induction Machines
- Ability to acquire knowledge on separation of losses

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

- Synchronous Induction motor 3HP – 1 No.
- DC Shunt Motor Coupled With Three phase Alternator – 4 nos
- DC Shunt Motor Coupled With Three phase Slip ring Induction motor – 1 No.
- Three Phase Induction Motor with Loading Arrangement – 2 nos
- Single Phase Induction Motor with Loading Arrangement – 2 nos
- Tachometer -Digital/Analog – 8 nos
- Single Phase Auto Transformer – 2 nos
- Three Phase Auto Transformer – 3 nos
- Single Phase Resistive Loading Bank – 2 nos
- Three Phase Resistive Loading Bank – 2 nos
- Capacitor Bank – 1 No.

20153L48

**LINEAR AND DIGITAL INTEGRATED
CIRCUITS LABORATORY**

L T P C
0 0 3 2

OBJECTIVES:

- To learn design, testing and characterizing of circuit behavior with digital and analog ICs.

LIST OF EXPERIMENTS

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
7. Study of multiplexer and de multiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Voltage to frequency characteristics of NE/ SE 566 IC.
11. Variability Voltage Regulator using IC LM320.

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the student should have the :

- Ability to understand and implement Boolean Functions.
- Ability to understand the importance of code conversion
- Ability to Design and implement 4-bit shift registers
- Ability to acquire knowledge on Application of Op-Amp
- Ability to Design and implement counters using specific counter IC.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual ,(0-30V) variability Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	
6	Bread board	10	

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficient quantity)			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

20153C51

POWER SYSTEM ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To model the power system under steady state operating condition
- || To understand and apply iterative techniques for power flow analysis
- || To model and carry out short circuit studies on power system
- || To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off-nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to model the power system under steady state operating condition
- || Ability to understand and apply iterative techniques for power flow analysis
- || Ability to model and carry out short circuit studies on power system
- || Ability to model and analyze stability problems in power system
- || Ability to acquire knowledge on Fault analysis.
- || Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

20153C52	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Architecture of μ P8085 & μ C 8051
- || Addressing modes & instruction set of 8085 & 8051.
- || Need & use of Interrupt structure 8085 & 8051.
- || Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- || Ability to need & use of Interrupt structure 8085 & 8051.
- || Ability to understand the importance of Interfacing
- || Ability to explain the architecture of Microprocessor and Microcontroller.
- || Ability to write the assembly language programme.
- || Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D. Kinley 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM," Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Edu, 2013.
4. Ajay V. Deshmukh, 'Microcontroller Theory & Applications', McGraw Hill Edu, 2016
5. Douglas V. Hall, 'Microprocessor and Interfacing', McGraw Hill Edu, 2016.

20153C53**POWER ELECTRONICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Different types of power semiconductor devices and their switching
- || Operation, characteristics and performance parameters of controlled rectifiers
- || Operation, switching techniques and basic topologies of DC-DC switching regulators.
- || Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- || Operation of AC voltage controller and various configurations.

UNIT I	POWER SEMI-CONDUCTOR DEVICES	9
Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.		
UNIT II	PHASE-CONTROLLED CONVERTERS	9
2-pulse, 3-pulse and 6-pulse converters – performance parameters – Effect of source inductance – Firing Schemes for converter – Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.		
UNIT III	DC TO DC CONVERTERS	9
Step-down and step-up chopper-control strategy – Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.		
UNIT IV	INVERTERS	9
Single phase and three phase voltage source inverters (both 120° mode and 180° mode) – Voltage & harmonic control – PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation – Current source inverter, Applications-Induction heating, UPS.		
UNIT V	AC TO AC CONVERTERS	9
Single phase and Three phase AC voltage controllers – Control strategy- Power Factor Control – Multistage sequence control – single phase and three phase cyclo converters – Introduction to Matrix converters, Applications – welding .		

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to analyse AC-AC and DC-DC and DC-AC converters.
- || Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCES

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal, "Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

20153C55

DIGITAL SIGNAL PROCESSING

L	T	P	C
2	2	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Signals and systems & their mathematical representation.
- || Discrete time systems.
- || Transformation techniques & their computation. Filters and their design for digital implementation. Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION 6+6

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT &DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 6+6

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 6+6

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.

TOTAL : 60 PERIODS**OUTCOMES:**

1. Ability to understand the importance of Fourier transform, digital filters and DS Processors.
2. Ability to acquire knowledge on Signals and systems & their mathematical representation.
3. Ability to understand and analyze the discrete time systems.
4. Ability to analyze the transformation techniques & their computation.
5. Ability to understand the types of filters and their design for digital implementation.
6. Ability to acquire knowledge on programmability digital signal processor & quantization effects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.

2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman, 'Fundamentals of Digital Signal Processing', Wiley, 2013

REFERENCES

1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

20153C56

OBJECT ORIENTED PROGRAMMING

L T P C
3 0 0 3

OBJECTIVES:

- || To understand Object Oriented Programming concepts and basic characteristics of Java
- || To know the principles of packages, inheritance and interfaces
- || To define exceptions and use I/O streams
- || To develop a java application with threads and generics classes
- || To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING**9**

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of the course, students will be able to:

- || Develop Java programs using OOP principles
- || Develop Java programs with the concepts inheritance and interfaces
- || Build Java applications using exceptions and I/O streams
- || Develop Java applications with threads and generics classes
- || Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

20153L57**CONTROL AND INSTRUMENTATION LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS**CONTROLSYSTEMS:**

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks –AC and DC Bridges

9. Dynamics of Sensors/Transducers

(a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f) Flow

10 Power and Energy Measurement

11 Signal Conditioning

(a) Instrumentation Amplifier

(b) Analog – Digital and Digital –Analog converters (ADC and DACs)

12 Process Simulation

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand control theory and apply them to electrical engineering problems.
- || Ability to analyze the various types of converters.
- || Ability to design compensators
- || Ability to understand the basic concepts of bridge networks.
- || Ability to the basics of signal conditioning circuits.
- || Ability to study the simulation packages.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**CONTROLSYSTEMS:**

1. PID controller simulation and learner kit – 1 No.
 2. Digital storage Oscilloscope for capturing transience- 1 No
- 2 Personal Computer with control system simulation packages - 10 Nos
3. DC motor –Generator test set-up for evaluation of motor parameters
 4. CRO 30MHz – 1 No.
 5. 2MHz Function Generator – 1No.
 6. Position Control Systems Kit (with manual) – 1 No., Tacho Generator Coupling set
 7. AC Synchro transmitter& receiver – 1No.
 8. Sufficient number of Digital multi meters, speed and torque sensors

INSTRUMENTATION:

9. R, L, C Bridge kit (with manual)
10. a) Electric heater – 1No.
Thermometer – 1No. Thermistor (silicon type) RTD nickel type – 1No.
- b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump – 1 No. (with necessary connecting tubes)
- c) LVDT 20mm core length movability type – 1No. CRO 30MHz – 1No. d)
Optical sensor – 1 No. Light source
- e) Strain Gauge Kit with Handy lever beam – 1No.

- 100gm weights – 10 nos
 f) Flow measurement Trainer kit – 1 No.
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter
 Voltmeter Rheostat Stop watch
 Connecting wires (3/20)
 12. IC Transistor kit – 1No.
 13. Instrumentation Amplifier kit-1 No
 14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

20153L58

**OBJECT ORIENTED PROGRAMMING
 LABORATORY**

**LT P C
 0 0 3 2**

COURSE OBJECTIVES

- || To build software development skills using java programming for real-world applications.
- || To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- || To develop applications using generic programming and event handling.

List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:

- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units - Rs. 6 per unit

- If the type of the EB connection is commercial, calculate the amount to be paid as follows:

- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. Write a program to perform string operations using ArrayList. Write functions for the following
 - a. Append - add at end
 - b. Insert – add at particular index c.
 - Search
 - d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

COURSE OUTCOMES**TOTAL : 60 PERIODS**

Upon completion of the course, the students will be able to | | Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

- | | Develop and implement Java programs with arraylist, exception handling and multithreading .
- | | Design applications using file processing, generic programming and event handling.

20153L59

PROFESSIONAL COMMUNICATION**L T P C**
0 0 2 1**OBJECTIVES: The course aims to:**

- || Enhance the Employability and Career Skills of students
- || Orient the students towards grooming as a professional
- || Make them Employability Graduates
- || Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term career plan-making career changes.

TOTAL : 30 PERIODS**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

Recommended Software

1. **Globearena**
2. **Win English**

REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

SOLID STATE DRIVES

L	T	P	C
3	0	0	3

20153C61

OBJECTIVES:

To impart knowledge on the following Topics

- || Steady state operation and transient dynamics of a motor load system.
- || Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- || Operation and performance of AC motor drives.
- || Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive- Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control- Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and suggest a converter for solid state drive.
- || Ability to select suitability drive for the given application.
- || Ability to study about the steady state operation and transient dynamics of a motor load system.
- || Ability to analyze the operation of the converter/chopper fed dc drive.
- || Ability to analyze the operation and performance of AC motor drives.
- || Ability to analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, “ Electric Drives Concepts and Applications ”, 2e, McGraw Hill, 2016

2. Shaahin Felizadeh, “Electric Machines and Drives”, CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, “Electrical Machines and Drives System,” Elsevier 2012.
4. Theodore Wildi, “ Electrical Machines ,Drives and power systems ,6th edition, Pearson Education ,2015
5. N.K. De., P.K. SEN” Electric drives” PHI, 2012.

20153C62**PROTECTION AND SWITCHGEAR**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- || Characteristics and functions of relays and protection schemes.
- || Apparatus protection, static and numerical relays
- || Functioning of circuit breaker

UNIT I PROTECTION SCHEMES**9**

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS**9**

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION**9**

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION**9**

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS**9**

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF6, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Electromagnetic and Static Relays.
- || Ability to suggest suitability circuit breaker.
- || Ability to find the causes of abnormal operating conditions of the apparatus and system.

- || Ability to analyze the characteristics and functions of relays and protection schemes.
- || Ability to study about the apparatus protection, static and numerical relays.
- || Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age International Pvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., New Delhi, 2009.
5. VK Metha, "Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani, 'Protection and Switchgear' Oxford University Press, 2011.

20153C63

EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES

:

To impart knowledge on the following Topics

- || Building Blocks of Embedded System
- || Various Embedded Development Strategies
- || Bus Communication in processors, Input/output interfacing.
- || Various processor scheduling algorithms.
- || Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model,

Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication–synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze Embedded systems.
- || Ability to suggest an embedded system for a given application.
- || Ability to operate various Embedded Development Strategies
- || Ability to study about the bus Communication in processors.
- || Ability to acquire knowledge on various processor scheduling algorithms.
- || Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010
2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013
3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.
4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

20153L66 POWER ELECTRONICS AND DRIVES LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- || To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter

- | | |
|----|---|
| 8 | IGBT based three phase PWM inverter |
| 9 | AC Voltage controller |
| 10 | Switched mode power converter. |
| 11 | Simulation of PE circuits (1 Φ & 3 Φ semi converters, 1 Φ & 3 Φ full converters, DC-DC converters, AC voltage controllers). |
| 12 | Characteristics of GTO & IGCT. |
| 13 | Characteristics of PMLD motor |

TOTAL: 60 PERIODS

OUTCOMES:

- || Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
- || Ability to experiment about switching characteristics various switches.
- || Ability to analyze about AC to DC converter circuits.
- || Ability to analyze about DC to AC circuits.
- || Ability to acquire knowledge on AC to AC converters
- || Ability to acquire knowledge on simulation software.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Device characteristics(for SCR, MOSFET, TRIAC,GTO,IGCT and IGBT kit with built-in / discrete power supply and meters) - 2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers (Built in/ Discrete) – 1 each
4. IGBT based single phase PWM inverter module/Discrete Component – 2
5. IGBT based three phase PWM inverter module/Discrete Component – 2
6. Switched mode power converter module/Discrete Component – 2
7. SCR & TRIAC based 1 phase AC controller along with lamp or rheostat load - 2
8. Cyclo converter kit with firing module – 1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer – 5
12. Single phase Auto transformer –3
13. Components (Inductance, Capacitance) 3 set for each
14. Multimeter – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 value
17. Work tabilitys – 10
18. DC and AC meters of required ranges – 20
19. Component data sheets to be provided

20153L67

**MICROPROCESSORS AND MICROCONTROLLERS
LABORATORY**

L T P C
0 0 3 2

OBJECTIVES:

- || To provide training on programming of microprocessors and microcontrollers and understand the interface requirements.
- || To simulate various microprocessors and microcontrollers using KEIL or Equivalent simulator.

LIST OF EXPERIMENTS

- 1 Simple arithmetic operations: addition / subtraction / multiplication / division.
- 2 Programming with control instructions:
 - (i) Ascending / Descending order, Maximum / Minimum of numbers. (ii) Programs using Rotate instructions.
 - (iii) Hex / ASCII / BCD code conversions.
- 3 Interface Experiments: with 8085
 - (i) A/D Interfacing. & D/A Interfacing.
- 4 Traffic light controller.
- 5 I/O Port / Serial communication
- 6 Programming Practices with Simulators/Emulators/open source
- 7 Read a key ,interface display
- 8 Demonstration of basic instructions with 8051 Micro controller execution, including: (i) Conditional jumps & looping
 - (ii) Calling subroutines.
- 9 Programming I/O Port and timer of 8051 (i) study on interface with A/D & D/A
 - (ii) Study on interface with DC & AC motors
- 10 Application hardware development using embedded processors.

TOTAL: 60 PERIODS**OUTCOMES:**

- || Ability to understand and apply computing platform and software for engineering problems.
- || Ability to programming logics for code conversion.
- || Ability to acquire knowledge on A/D and D/A.
- || Ability to understand basics of serial communication.
- || Ability to understand and impart knowledge in DC and AC motor interfacing.
- || Ability to understand basics of software simulators.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power Supply	15
2.	8051 Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

20153MP68

MINI PROJECT

LTPC
0042**OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

20153C71

HIGH VOLTAGE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of cabilities.

OUTCOMES:**TOTAL : 45 PERIODS**

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory &Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray, 'An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

20153C72	POWER SYSTEM OPERATION AND CONTROL	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following topics

- || Significance of power system operation and control.
- || Real power-frequency interaction and design of power-frequency controller.
- || Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- || Economic operation of power system.
- || SCADA and its application for real time operation and control of power systems

UNIT I PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL 9

Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation - real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand the day-to-day operation of electric power system.
- || Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- || Ability to understand the significance of power system operation and control.
- || Ability to acquire knowledge on real power-frequency interaction.
- || Ability to understand the reactive power-voltage interaction.
- || Ability to design SCADA and its application for real time operation

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

20153C73

RENEWABLE ENERGY SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || Awareness about renewable Energy Sources and technologies. Adequate
- || inputs on a variety of issues in harnessing renewable Energy. Recognize
- || current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES**9**

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY**9**

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS**9**

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY**9**

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES**9**

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications.

Energy	Storage	System-	Hybrid	Energy	Systems.
TOTAL : 45					PERIODS

OUTCOMES:

- || Ability to create awareness about renewable Energy Sources and technologies.
- || Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- || Ability to recognize current and possible future role of renewable energy sources.
- || Ability to explain the various renewable energy resources and technologies and their applications.
- || Ability to understand basics about biomass energy.
- || Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis,” Engineering Applications in Sustainable Design and Development”, Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, ‘Non-conventional Energy resources’ Pearson Education ,2015.

20153L77**POWER SYSTEM SIMULATION LABORATORY****L T P C****0 0 3 2****OBJECTIVES:**

- || To provide better understanding of power system analysis through digital simulation.

LIST OF EXPERIMENTS

- 1 Computation of Transmission Line Parameters
- 2 Formation of Bus Admittance and Impedance Matrices and Solution of Networks
- 3 Power Flow Analysis using Gauss-Seidel Method
- 4 Power Flow Analysis using Newton Raphson Method
- 5 Symmetric and unsymmetrical fault analysis
- 6 Transient stability analysis of SMIB System
- 7 Economic Dispatch in Power Systems
- 8 Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
- 9 State estimation: Weighted least square estimation
- 10 Electromagnetic Transients in Power Systems : Transmission Line Energization

OUTCOMES:**TOTAL: 60 PERIODS**

- || Ability to understand power system planning and operational studies.
- || Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- || Ability to analyze the power flow using GS and NR method
- || Ability to find Symmetric and Unsymmetrical fault
- || Ability to understand the economic dispatch.
- || Ability to analyze the electromagnetic transients.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Personal computers (Intel i3, 80GB, 2GBRAM) – 30 nos
2. Printer laser- 1 No.
3. Dot matrix- 1 No.
4. Server (Intel i5, 80GB, 2GBRAM) (High Speed Processor) – 1 No.
5. Software: any power system simulation software with 5 user license
6. Compilers: C, C++, VB, VC++ - 30 users

RENEWABLE ENERGY SYSTEMS LABORATORY	L	T	P	C
	0	0	3	2

OBJECTIVES:

- || To train the students in Renewable Energy Sources and technologies.
- || To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

- 1 Simulation study on Solar PV Energy System.
- 2 Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
- 3 Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
- 4 Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
- 5 Simulation study on Wind Energy Generator.
- 6 Experiment on Performance assessment of micro Wind Energy Generator.
- 7 Simulation study on Hybrid (Solar-Wind) Power System.
- 8 Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
- 9 Simulation study on Hydel Power.
- 10 Experiment on Performance Assessment of 100W Fuel Cell.
- 11 Simulation study on Intelligent Controllers for Hybrid Systems.

OUTCOMES:

- || Ability to understand and analyze Renewable energy systems.

TOTAL: 60 PERIODS

- || Ability to train the students in Renewable Energy Sources and technologies.
- || Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- || Ability to simulate the various Renewable energy sources.
- || Ability to recognize current and possible future role of Renewable energy sources.
- || Ability to understand basics of Intelligent Controllers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Name of the equipments / Components	Quantity Required	Remarks
1.	Personal computers (Intel i3, 80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	Digital Multimeter	10	Digital
4.	PV panels - 100W, 24V	1	
5.	Battery storage system with charge and discharge control 40Ah	1	
6.	PV Emulator	1	
7.	Micro Wind Energy Generator module	1	

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

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0 0 2 2

Electric Circuits and Fields:

Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems:

Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines:

Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems:

Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems:

Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements:

Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics:

Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives:

Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

20153E64A

ADVANCED CONTROL SYSTEM**L T P C**
2 2 0 3**OBJECTIVES**

- i. To provide knowledge on design state feedback control and state observer.
- ii. To provide knowledge in phase plane analysis.
- iii. To give basic knowledge in describing function analysis.
- iv. To study the design of optimal controller.
- v. To study the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE ANALYSIS**6+6**

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

UNIT II STATE VARIABLE DESIGN**6+6**

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.

UNIT III SAMPLED DATA ANALYSIS**6+6**

Introduction spectrum analysis of sampling process signal reconstruction difference equations The Z transform function, the inverse Z transform function, response of Linear discrete system, the Z transform analysis of sampled data control systems, response between sampling instants, the Z and S domain relationship. Stability analysis and compensation techniques.

UNIT IV NON LINEAR SYSTEMS**6+6**

Introduction, common physical nonlinearities, The phase plane method: concepts, singular points, stability of non linear systems, construction of phase trajectories system analysis by phase plane method. The describing function method, stability analysis by describing function method, Jump resonance.

UNIT V OPTIMAL CONTROL**6+6**

Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal control performance measures - Optimal state regulator design: Lyapunov equation, Matrix Riccati equation - LQR steady state optimal control – Application examples.

OUTCOMES:**TOTAL: 60 PERIODS**

- i. Able to design state feedback controller and state observer.
- ii. Able to understand and analyse linear and nonlinear systems using phase plane method.
- iii. Able to understand and analyse nonlinear systems using describing function method.
- iv. Able to understand and design optimal controller.
- v. Able to understand optimal estimator including Kalman Filter.
- vi. Ability to apply advanced control strategies to practical engineering problems.

TEXT BOOKS:

1. M.Gopal, "Digital Control and State Variable Methods", 4th edition, Mc Graw Hill India, 2012
2. K. Ogata, 'Modern Control Engineering', 5th Edition, Pearson, 2012.
3. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

REFERENCES:

1. M.Gopal, Modern Control System Theory, 3rd edition, New Age International Publishers, 2014.
2. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Taylor and Francis Group, 2011.
3. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.

20153E64B

VISUAL LANGUAGES AND APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- 1 To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- 1 To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- 1 To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- 1 To study about the integrated development programming event driven programming, variabilitys, constants, procedures and basic ActiveX controls in visual basic.
- 1 To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I	FUNDAMENTALS OF WINDOWS AND MFC	9
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Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective. The benefits of C++ and MFC - MFC design philosophy - Document / View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map. Drawing the lines - Curves - Ellipse - Polygons and other shapes. GDI pens - Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II	RESOURCES AND CONTROLS	9
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Creating a menu - Loading and displaying a menu - Responding to menu commands - Command ranges - Updating the items in menu, update ranges - Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus - Cascading menus - Context menus. The C button class - C list box class - C static class - The font view application - C edit class - C combo box class - C scrollbar class. Model dialog boxes - Modeless dialog boxes.

UNIT III	DOCUMENT / VIEW ARCHITECTURE	9
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The in existence function revisited - Document object - View object - Frame window object - Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document - Mid squares application - Supporting multiple document types - Alternatives to MDI. Splitter Windows: Dynamic splitter window - Static splitter windows. Creating & initializing a toolbar - Controlling the toolbar's visibility - Creating & initializing a status bar - Creating custom status bar panes - Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing - C file derivatives - Serialization basics - Writing serializability classes.

UNIT IV	FUNDAMENTALS OF VISUAL BASIC	9
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Menu bar - Tool bar - Project explorer - Toolbox - Properties window - Form designer - Form layout - Intermediate window. Designing the user interface: Aligning the controls - Running the application - Visual development and event driven programming.

Variabilitys: Declaration - Types - Converting variability types - User defined data types - Lifetime of a variability. Constants - Arrays - Types of arrays. Procedures: Subroutines - Functions - Calling procedures. Text box controls - List box & Combo box controls - Scroll bar and slider controls - File controls.

UNIT V DATABASE PROGRAMMING WITH VB**9**

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Tablity def object, Query def object. Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

OUTCOMES:

- || Ability to understand and apply computing platform and software for engineering problems
- || Ability to study about the concepts of windows programming models.
- || Ability to study the concepts of Menu basics, menu magic and classic controls.
- || Ability to study the concept of Document/View Architecture with single & multiple document interface.
- || Ability to study about the integrated development programming event driven programming.
- || Ability to understand the database and the database management system.

TEXT BOOKS:

1. Jeff Prosise, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors (P) Ltd, Reprinted, 2002.
2. Evangelos Petroustos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFERENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, McGraw Hill, reprinted, 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', McGraw Hill, Reprinted, 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

20153E64C**DESIGN OF ELECTRICAL APPARATUS**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Magnetic circuit parameters and thermal rating of various types of electrical machines.
- || Armature and field systems for D.C. machines.
- || Core, yoke, windings and cooling systems of transformers.
- || Design of stator and rotor of induction machines and synchronous machines.
- || The importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE**9**

Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage – Leakage in Armature. Design of lap winding and wave winding.

UNIT II DESIGN OF TRANSFORMERS**9**

Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES**9**

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS**9**

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizing current - Short circuit current – Circle diagram - Computer program: Design of slip-ring rotor

UNIT V DESIGN OF SYNCHRONOUS MACHINES**9**

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field MMF – Design of field winding – Design of turbo alternators -Computer program: Design of Stator main dimensions-Brushless DC Machines

OUTCOMES:**TOTAL : 45 PERIODS**

- || Ability to understand basics of design considerations for rotating and static electrical machines
- || Ability to design of field system for its application.
- || Ability to design single and three phase transformer.
- || Ability to design armature and field of DC machines.
- || Ability to design stator and rotor of induction motor.

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, Fifth Edition, 1984.
2. M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Lt, 2011.
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, Vikas Publishing House Private Limited, 1981.
3. V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications, 2008

20153E64D

POWER SYSTEM STABILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- || To understand the fundamental concepts of stability of power systems and its classification.
- || To expose the students to dynamic behaviour of the power system for small and large disturbances.
- || To understand and enhance the stability of power systems.

UNIT I INTRODUCTION TO STABILITY 9

Fundamental concepts - Stability and energy of a system - Power System Stability: Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronous machine for stability studies(classical model) - Rotor dynamics and the swing equation.

UNIT II SMALL-SIGNAL STABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation of small-signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and participation factor. Small-signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNIT III TRANSIENT STABILITY 9

Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA) with partitioned – explicit approaches- Application of TSA to SMIB system.

UNIT IV VOLTAGE STABILITY 9

Factors affecting voltage stability- Classification of Voltage stability-Transmission system characteristics- Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices- Voltage collapse.

UNIT V ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY 9

Power System Stabilizer –. Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast- valving, high-speed excitation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will attain knowledge about the stability of power system
- || Learners will have knowledge on small-signal stability, transient stability and voltage stability.
- || Learners will be able to understand the dynamic behaviour of synchronous generator for different disturbances.
- || Learners will be able to understand the various methods to enhance the stability of a power system.

TEXT BOOKS:

1. Power system stability and control ,P. Kundur ; edited by Neal J. Balu, Mark G. Lauby, McGraw-Hill, 1994.
2. R.Ramnujam,” Power System Dynamics Analysis and Simulation, PHI Learning Private Limited, New Delhi, 2009
3. T.V. Cutsem and C.Vournas, “Voltage Stability of Electric Power Systems”, Kluwer publishers, 1998.

REFERENCES

- 1 Peter W., Saucer, Pai M.A., “Power System Dynamics and Stability, Pearson Education (Singapore), 9th Edition, 2007.
- 2 EW. Kimbark., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 2013.
- 3 SB. Crary., “Power System Stability”, John Wiley & Sons Limited, New Jersey, 1955.
- 4 K.N. Shubhanga,“Power System Analysis” Pearson, 2017.
- 5 Power systems dynamics: Stability and control / K.R. Padiyar, BS Publications, 2008
- 6 Power system control and Stability P.M. Anderson, A.A. Foud, Iowa State University Press, 1977.

20153E64E

MODERN POWER CONVERTERS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Switched mode power supplies
- Matrix Converter
- Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

OUTCOMES:**TOTAL : 45 PERIODS**

- Ability to suggest converters for AC-DC conversion and SMPS

TEXT BOOKS:

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press, NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008
4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons, 2009.

20153E64F**INTELLECTUAL PROPERTY RIGHTS****L T P C
3 0 0 3****OBJECTIVE:**

- || To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION**9**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs**10**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS**10**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW**9**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs**7**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL:45 PERIODS

OUTCOME:

- + | Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCES:

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

20153E65A

PRINCIPLES OF ROBOTICS**L T P C**
3 0 0 3**OBJECTIVES:**

- To introduce the functional elements of Robotics
- To impart knowledge on the direct and inverse kinematics
- To introduce the manipulator differential motion and control
- To educate on various path planning techniques
- To introduce the dynamics and control of manipulators

UNIT I BASIC CONCEPTS**9**

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues- Various manipulators – Sensors - work cell - Programming languages.

UNIT II DIRECT AND INVERSE KINEMATICS**9**

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS**9**

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.

UNIT IV PATH PLANNING**9**

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNIT V DYNAMICS AND CONTROL**9**

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

TOTAL: 45 PERIOD**OUTCOMES:**

- Ability to understand basic concept of robotics.
- To analyze Instrumentation systems and their applications to various
- To know about the differential motion and statics in robotics
- To know about the various path planning techniques.
- To know about the dynamics and control in robotics industries.

TEXT BOOKS:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi, 4th Reprint, 2005.
2. John J. Craig, Introduction to Robotics Mechanics and Control, Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nagel and N. G. Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2. K. K.Appu Kuttan, Robotics, I K International, 2007.
3. Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, “ Embedded Systems & Robotics” – Projects using the 8051 Microcontroller”, Cengage Learning, 2009.

20153E65B**SPECIAL ELECTRICAL MACHINES**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctance motors.
- Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS**9**

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM)**9**

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS**9**

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM)**9**

Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES**9**

Constructional features – Principle of operation and Characteristics of Hysteresis motor-Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- Ability to select a special Machine for a particular application.

TEXT BOOKS:

- K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984
- E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

20153E65C

POWER QUALITY

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- Causes & Mitigation techniques of various PQ events.
- Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY**9**

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL**9**

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS**9**

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS**9**

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES**9**

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.
- Ability to analyze the causes & Mitigation techniques of various PQ events.
- Ability to study about the various Active & Passive power filters.
- Ability to understand the concepts about Voltage and current distortions, harmonics.
- Ability to analyze and design the passive filters.
- Ability to acquire knowledge on compensation techniques.
- Ability to acquire knowledge on DVR.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagham, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality”, McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, “Power System Quality Assessment”, (New York : Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” Wiley, 2015.

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press), 2000.

20153E65D

EHVAC TRANSMISSION

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- EHVAC Transmission lines
- Electrostatic field of AC lines
- Corona in E.H.V. lines

UNIT I INTRODUCTION 9

EHVAC Transmission line trends and preliminary aspect - standard transmission voltages - Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines - Positive, negative and zero sequence impedance - Line Parameters for Modes of Propagation.

UNIT II ELECTROSTATIC FIELDS 9

Electrostatic field and voltage gradients - Calculations of electrostatic field of AC lines - Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines - Voltage gradients on sub conductor.

UNIT III POWER CONTROL 9

Electrostatic induction in un energized lines - Measurement of field and voltage gradients for three phase single and double circuit lines - Un energized lines. Power Frequency Voltage control and overvoltage in EHV lines: No load voltage - Charging currents at power frequency- Voltage control - Shunt and Series compensation - Static VAR compensation.

UNIT IV CORONA EFFECTS AND RADIO INTERFERENCE 9

Corona in EHV lines - Corona loss formulae-Charge voltage diagram- Attenuation of traveling waves due to Corona - Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise - Frequency spectrum of RI fields - Measurements of RI and RIV.

UNIT V STEADY STATE AND TRANSIENT LIMITS 9

Design of EHV lines based on steady state and transient limits - EHV capabilities and their characteristics-Introduction six phase transmission - UHV.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to understand the principles and types of EHVAC system.
- Ability to analyze the electrostatic field of AC lines
- Ability to study about the compensation.
- Ability to study about the corona in E.H.V. lines
- Ability to understand the EHV capabilities.
- Ability to analyze the steady state and transient limits.

TEXT BOOKS:

1. Rokosh Das Begamudre, "Extra High Voltage AC Transmission Engineering"- Wiley Eastern LTD., NEW DELHI 1990.
2. S. Rao, "HVAC and HVDC Transmission, Engineering and Practice" Khanna Publisher, Delhi, 1990.

REFERENCES

1. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India Private Limited, 2013.

2. RD Begamudre, "Extra High Voltage AC Transmission Engineering"– New Academic Science Ltd; 4 edition 2011.
3. Edison," EHV Transmission line"- Electric Institution, GEC, 1968.

20153E65E

COMMUNICATION ENGINEERING

L T P C

3 0 0 3

OBJECTIVES:

- ✓ To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- ✓ To study the various analog and digital modulation techniques
- ✓ To study the principles behind information theory and coding
- ✓ To study the various digital communication techniques

UNIT I ANALOG MODULATION**9**

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNIT II PULSE MODULATION**9**

Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL MODULATION AND TRANSMISSION**9**

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING**9**

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon–Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS**9**

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

OUTCOMES:

At the end of the course, the student should be able to:

- ✓ Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- ✓ Apply analog and digital communication techniques.
- ✓ Use data and pulse communication techniques.
- ✓ Analyze Source and Error control coding.

TEXT BOOKS:

1. H Taub, D L Schilling, G Saha, “Principles of Communication Systems” TMH 2007
2. S. Haykin “Digital Communications” John Wiley 2005

REFERENCES:

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University
2. H P Hsu, Schaum Outline Series – “Analog and Digital Communications” TMH 2006
3. B.Sklar, Digital Communications Fundamentals and Applications” 2/e Pearson Education 2007.

20153E75A

DISASTER MANAGEMENT**LT P C****3 0 0 3****OBJECTIVES:**

- || To provide students an exposure to disasters, their significance and types.
- || To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- || To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- || To enhance awareness of institutional processes in the country and
- || To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS**9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)**9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA)
– Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA**9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS**9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS**OUTCOMES:**

The students will be able to

- || Differentiate the types of disasters, causes and their impact on environment and society
- || Assess vulnerability and various methods of risk reduction measures as well as mitigation.

- || Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

20153E75B**HUMAN RIGHTS****LT P C
3 0 3****OBJECTIVES :**

- || To sensitize the Engineering students to various aspects of Human Rights.

UNIT I**9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II**9**

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III**9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV**9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V**9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disability persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS**OUTCOME :**

- || Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

20153E75C

OPERATIONS RESEARCH

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS**15**

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS**8**

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III INVENTORY MODELS**6**

Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS**6**

Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS**10**

Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variability search technique – Dynamic Programming – Simple Problem.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of this course, the students can ability to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

1. Hillier and Libebberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.

2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

20153E75D

PROBABILITY AND STATISTICS

L	T	P	C
3	0	0	3

OBJECTIVES :

- || This course aims at providing the required skill to apply the statistical tools in engineering problems.
- || To introduce the basic concepts of probability and random variables.
- || To introduce the basic concepts of two dimensional random variables.
- || To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- || To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES**12**

Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES**12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS**12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS**12**

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V STATISTICAL QUALITY CONTROL**12**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon successful completion of the course, students will be able to:

- || Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- || Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
 - || Apply the concept of testing of hypothesis for small and large samples in real life problems.
- || Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- || Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES :

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

20153E75E

FIBRE OPTICS AND LASER INSTRUMENTSLTPC
3003**AIM**

:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

COURSE OBJECTIVES

- || To expose the students to the basic concepts of optical fibres and their properties.
- || To provide adequate knowledge about the Industrial applications of optical fibres.
- || To expose the students to the Laser fundamentals.
- || To provide adequate knowledge about Industrial application of lasers.
- || To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES**9**

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fibre: Total internal reflection, Acceptance angle (θ_a), Numerical aperture and Skew mode, –Different types of fibres and their properties: Single and multimode fibers and Step index and graded index fibers,– fibre characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses
– Dispersion – Connectors and splicers –Fibre termination – Optical sources: Light Emitting Diode (LED), – Optical detectors: PIN Diode.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES**9**

Fibre optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fibre Optic Sensor and Displacementsensor (Extrinsic Sensor) – Fibre optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS**9**

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS**9**

Laser for measurement of distance, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS**9**

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 PERIODS**COURSE OUTCOMES (COs):**

1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
3. Understand laser theory and laser generation system.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.

TEXT BOOKS:

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
3. Eric Udd, William B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists", John Wiley & Sons, 2011.

REFERENCES:

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Ready, "Industrial Applications of Lasers", Academic Press, Digitized in 2008.

4. Monte Ross, 'Laser Applications', McGraw Hill, 1968.
5. John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
6. Keiser, G., "Optical Fiber Communication", McGraw-Hill, 3rd Edition, 2000. <http://nptel.ac.in/courses/117101002/>

20153E81A

FLEXIBLE AC TRANSMISSION SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || The start-of-art of the power system
- || Performance of power systems with FACTS controllers.
- || FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION**9**

Real and reactive power control in electrical power transmission lines–loads & system compensation–Uncompensated transmission line–shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS**9**

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on system voltage–Design of SVC voltage regulator–TCR-FC-TCR–Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability – Steady state power transfer –Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS**9**

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS**9**

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer–enhancement of transient stability–prevention of voltage instability. SSSC–operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies- Dynamic voltage restorer(DVR).

UNIT V ADVANCED FACTS CONTROLLERS**9**

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand, analyze and develop analytical model of FACTS controller for power system application.
- || Ability to understand the concepts about load compensation techniques.
- || Ability to acquire knowledge on facts devices.
- || Ability to understand the start-of-art of the power system
- || Ability to analyze the performance of steady state and transients of facts controllers.
- || Ability to study about advanced FACTS controllers.

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEE press andJohnWiley&Sons,Inc,2002.
2. NarainG. Hingorani, “Understanding FACTS–Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors,Delhi-110006,2011.
3. T.J.E Miller, Power Electronics in power systems, John Wiley and sons.

REFERENCES

1. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
2. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.

SOFT COMPUTING TECHNIQUES

20153E81B

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Basics of artificial neural network.
- || Concepts of modelling and control of neural and fuzzy control schemes.
- || Features of hybrid control schemes.

UNIT I	ARTIFICIAL NEURAL NETWORK	9
Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.		

UNIT II	NEURAL NETWORKS FOR MODELING AND CONTROL	9
Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.		

UNIT III	FUZZY SET THEORY	9
Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.		

UNIT IV	FUZZY LOGIC FOR MODELING AND CONTROL	9
Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.		

UNIT V	HYBRID CONTROL SCHEMES	9
Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron – GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine – Case study – Familiarization with ANFIS toolbox.		

TOTAL : 45 PERIODS

OUTCOMES:

- | Ability to understand the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
- | Ability to understand the basics of artificial neural network.
- | Ability to get knowledge on modelling and control of neural.

- | Ability to get knowledge on modelling and control of fuzzy control schemes.
- | Ability to acquire knowledge on hybrid control schemes.
- | Ability to understand the concepts of Adaptive Resonance Theory

TEXT BOOKS:

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

REFERENCES

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)”, MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, “Fuzzy Modeling and Fuzzy Control Series: Control Engineering”, 2006

20153E81C

POWER SYSTEMS DYNAMICS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Basics of dynamics and stability problems
- || Modeling of synchronous machines
- || Excitation system and speed-governing controllers.
- || Small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer.
- Transient stability simulation of multi machine power system.

UNIT I INTRODUCTION 9

Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING 9

Synchronous machine - flux linkage equations - Park's transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY 9

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to understand and analyze power system operation, stability, control and protection.
- || Ability to get knowledge on the basics of dynamics and stability problems
- || Ability to design and modelling of synchronous machines

- || Ability to study about excitation system and speed-governing controllers.
- || Ability to understand the concept of small signal stability of a single-machine infinite bus system with excitation system.
- || Ability to analyze the transient stability simulation.

TEXT BOOKS:

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.
2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.
3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCES

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. EI-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition, 2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International, 2007.

20153E81D

SMPS AND UPS

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Modern power electronic converters and its applications in electric power utility.
- || Resonant converters and UPS

UNIT I DC-DC CONVERTERS 9

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II SWITCHED MODE POWER CONVERTERS 9

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III RESONANT CONVERTERS 9

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V POWER CONDITIONERS, UPS & FILTERS 9

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Ability to analyze the state space model for DC – DC converters
- || Ability to acquire knowledge on switched mode power converters.
- || Ability to understand the importance of Resonant Converters.
- || Ability to analyze the PWM techniques for DC-AC converters
- || Ability to acquire knowledge on modern power electronic converters and its applications in electric power utility.
- || Ability to acquire knowledge on filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. KjeldThorborg, "Power Electronics – In theory and Practice", Overseas Press, First Indian Edition 2005.
3. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.

REFERENCES

1. Philip T Krein, "Elements of Power Electronics", Oxford University Press
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters,

- Applications and design- Third Edition- John Wiley and Sons- 2006
3. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
 4. Erickson, Robert W, “Fundamentals of Power Electronics”, Springer, second edition, 2010.

20153E81E	ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- || To study the generation, conservation of electrical power and energy efficient equipments.
- || To understand the principle, design of illumination systems and energy efficiency lamps.
- || To study the methods of industrial heating and welding.
- || To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Variou types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS**OUTCOMES:**

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

20153E81F**PROFESSIONAL ETHICS IN ENGINEERING****LT P C****3 0 0 3****OBJECTIVES:**

- || To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES**10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS**9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION**9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES**8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS**OUTCOMES:**

- 1. Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education ’, Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

20153E81G**PRINCIPLES OF MANAGEMENT****L T P C
3 0 0 3****OBJECTIVES:**

- 1. To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING**9**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING**9**

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING**9**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING**9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

OUTCOMES:**TOTAL: 45 PERIODS**

- || Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have some basic knowledge on international aspect of management

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

20153E82A

ENERGY MANAGEMENT AND AUDITING

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || To impart concepts behind economic analysis and Load management.
- || Energy management on various electrical equipments and metering.
- || Concept of lighting systems and cogeneration.

UNIT I	INTRODUCTION	9
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Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targeting and reporting - Energy audit process.

UNIT II	ENERGY MANAGEMENT FOR MOTORS AND COGENERATION	9
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Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

UNIT III	LIGHTING SYSTEMS	9
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Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

UNIT IV	METERING FOR ENERGY MANAGEMENT	9
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Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

UNIT V	ECONOMIC ANALYSIS AND MODELS	9
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Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

TOTAL : 45 PERIODS

OUTCOMES:

- || Ability to understand the basics of Energy audit process.
- || Ability to understand the basics of energy management by cogeneration
- || Ability to acquire knowledge on Energy management in lighting systems
- || Ability to impart concepts behind economic analysis and Load management.
- || Ability to understand the importance of Energy management on various electrical equipment and metering.
- || Ability to acquire knowledge on HVAC.

TEXT BOOKS:

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists,.Logman Scientific & Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
5. National Productivity Council Guide Books

20153E82B**DATA STRUCTURES****LTPC
3003****OBJECTIVES:**

- || To understand the concepts of ADTs
- || To Learn linear data structures – lists, stacks, and queues
- || To understand sorting, searching and hashing algorithms
- || To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the student should be able to:

- || Implement abstract data types for linear data structures.
- || Apply the different linear and non-linear data structures to problem solutions.
- || Critically analyze the various sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008

20153E82C HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- Planning of DC power transmission and comparison with AC power transmission.
- HVDC converters. HVDC
- system control. Harmonics and
- design of filters.
- Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy– Firing angle control– Current and extinction angle control–Starting and stopping of DC link –Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis –case study

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the principles and types of HVDC system.
- Ability to analyze and understand the concepts of HVDC converters.
- Ability to acquire knowledge on DC link control.
- Ability to understand the concepts of reactive power management, harmonics and

power flow analysis.

- Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- Ability to understand the importance of power flow in HVDC system under steady state.

TEXT BOOKS:

1. Padiyar,K.R.,“HVDC power transmission system”, New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,“High Voltage Direct Current Transmission”, Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.,“ Power System Stability and Control”, McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG,“ High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Edward Wilson Kimbark,“ Direct Current Transmission”, Vol.I, Wiley inter science, New York, London, Sydney,1971.

20153E82D MICROCONTROLLER BASED SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES: To impart knowledge about the following topics:

- Architecture of PIC microcontroller
- Interrupts and timers
- Peripheral devices for data communication and transfer
- Functional blocks of ARM processor
- Architecture of ARM processors

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx– Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT II INTERRUPTS AND TIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variability strings.

UNIT III PERIPHERALS AND INTERFACING 9

I²C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV INTRODUCTION TO ARM PROCESSOR 9

Architecture –ARM programmer’s model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for

Operating systems.

UNIT V ARM ORGANIZATION 9

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply computing platform and software for engineering problems.
- Ability to understand the concepts of Architecture of PIC microcontroller
- Ability to acquire knowledge on Interrupts and timers.
- Ability to understand the importance of Peripheral devices for data communication.
- Ability to understand the basics of sensor interfacing
- Ability to acquire knowledge in Architecture of ARM processors

TEXT BOOKS:

1. Peatman,J.B., “Design with PIC Micro Controllers”PearsonEducation,3rdEdition, 2004.
2. Furber,S., “ARM System on Chip Architecture” Addison Wesley trade Computer Publication, 2000.

REFERENCES

1. Mazidi, M.A.,“PIC Microcontroller” Rollin Mckinlay, Danny causey ,Prentice Hall of India, 2007.

20153E82E

SMART GRID

L	T	P	C
3	0	0	3

OBJECTIVES: To impart knowledge about the following topics:

- || Smart Grid technologies, different smart meters and advanced metering infrastructure.
- || The power quality management issues in Smart Grid.
- || The high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering Infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broad band over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS**OUTCOMES:**

- || Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- || Learners will study about different Smart Grid technologies.
- || Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS:

1. Stuart Borlase "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2012.

REFERENCES

- Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol.7, No.4, November 2011.
- || Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids, vol.14, 2012.
- James Momohe "Smart Grid: Fundamentals of Design and Analysis", Wiley-IEEE Press, 2012.

20153E82F**BIOMEDICAL INSTRUMENTATION****L T P C
3 0 0 3****OBJECTIVES:**

- || To Introduce Fundamentals of Biomedical Engineering
- || To study the communication mechanics in a biomedical system with few examples
- || To study measurement of certain important electrical and non-electrical parameters

- || To understand the basic principles in imaging techniques
- || To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS

OUTCOMES: At the end of the course students will have the

- || Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- || Ability to provide latest ideas on devices of non-electrical devices.
- || Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- || Ability to understand the analysis systems of various organ types.
- || Ability to bring out the important and modern methods of imaging techniques and their analysis.
- || Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John

Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

20153E82G

FUNDAMENTALS OF NANOSCIENCE

L T P C

3 0 0 3

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms- multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS

7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobe in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

- | | Will familiarize about the science of nanomaterials
- | | Will demonstrate the preparation of nanomaterials
- | | Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.



PRIST UNIVERSITY

VALLAM, THANJAVUR.

DEPARTMENT OF
ELECTRICAL & ELECTRONICS
ENGINEERING

COURSE STRUCTURE

B.TECH EEE (PART TIME)

[REGULATION 2017]

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY
B.TECH -ELECTRICAL & ELECTRONICS ENGINEERING
PART TIME PROGRAMME

CURRICULUM FOR SEMESTER I TO VII

Regulation 2017

Semester – I

Sl. No	Subject Code	Subject Name	53L45 Week			C	IA	UE	TM
			L	T	P				
1	17148S11P	Transforms and Partial Differential Equations	3	1	0	4	50	50	100
2	17153H12P	Control System	3	1	0	4	50	50	100
3	17153H13P	Circuit Analysis and Networks	3	1	0	4	50	50	100
4	17153H14P	Electronic circuits	3	0	0	3	50	50	100
5	17153H15P	Electrical Machines-I	4	0	0	4	50	50	100
Total No of Credits						19	Total Marks	500	

Semester – II

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17148S21P	Numerical Methods	3	1	0	4	50	50	100
2	17150S22P	Computer Architecture	3	0	0	3	50	50	100
3	17153H23P	Electrical Machines-II	3	1	0	4	50	50	100
4	17153H24P	Digital Electronics	3	1	0	4	50	50	100
5	17153H25P	Transmission and Distribution	4	0	0	4	50	50	100
Total No of Credits						19	Total Marks	500	

Semester – III

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17148S31P	Probability and Statistics	3	1	0	4	50	50	100
2	17152S32P	Analog Integrated Circuits	3	1	0	4	50	50	100
3	17153H33P	Power Electronics	4	0	0	4	50	50	100
4	17153H34P	Measurements and Instrumentation	4	0	0	4	50	50	100
5	17153L35P	Machines Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks	500	

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

Semester –IV

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H41P	Protection and switch gear	4	0	0	4	50	50	100
2	17153H42P	High Voltage DC Transmission	3	1	0	4	50	50	100
3	17153H43P	Solid State Drives	3	1	0	4	50	50	100
4	171--E44_P	Elective –I	4	0	0	4	50	50	100
5	17153L45P	Control System & Measurements Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester – V

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H51P	Power System Analysis	3	1	0	4	50	50	100
2	17153H52P	Power Quality	3	1	0	4	50	50	100
3	17153H53P	Special Electrical Machines	4	0	0	4	50	50	100
4	171--E54_P	Elective –II	4	0	0	4	50	50	100
5	17153L55P	Power Electronics & Drives Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester –VI

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H61P	Utilization of Electrical Energy	3	1	0	4	50	50	100
2	17153H62P	Solid State Relays	4	0	0	4	50	50	100
3	17153H63P	Power System Operation and Control	4	0	0	4	50	50	100
4	171--E64_P	Elective –III	4	0	0	4	50	50	100
5	17153L65P	Power Systems Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester –VII

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17160S71P	Total Quality Management	3	0	0	3	50	50	100
2	17153H72P	Electrical Machine Design	3	1	0	4	50	50	100
3	17153H73P	Power Plant Engineering	4	0	0	4	50	50	100
4	171--E74_P	Elective –IV	3	0	0	3	50	50	100
5	17153P75P	Project Work	0	0	12	6	100	100	200
Total No of Credits						20	Total Marks		600

Total No of Credits from Semester I to VII – 170

LIST OF ELECTIVES

Elective I

Semester – IV

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153E44AP	Field Theory	3	1	0	4	50	50	100
2	17152E44BP	Fuzzy Logic and its applications	3	1	0	4	50	50	100
3	17153E44CP	BioMedical Instrumentation	4	0	0	4	50	50	100
4	17153E44DP	Modeling and Simulation of Solar Energy Systems	4	0	0	4	50	50	100

Elective II
Semester – V

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17158E54AP	Environmental Science and Engineering	4	0	0	4	50	50	100
2	17152E54BP	Artificial Neural Networks	4	0	0	4	50	50	100
3	17153E54CP	Communication Engineering	4	0	0	4	50	50	100
4	17154E54DP	Robotics	3	1	0	4	50	50	100

Elective III
Semester – VI

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17160E64AP	Principles of Management	4	0	0	4	50	50	100
2	17160E64BP	Professional Ethics	4	0	0	4	50	50	100
3	17152E64CP	Integrated opto-Electronic Devices	3	1	0	4	50	50	100
4	17153E64DP	Computer Aided Design of Electrical Apparatus	3	1	0	4	50	50	100

Elective IV
Semester – VII

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153E74AP	Power system transients	3	0	0	3	50	50	100
2	17153E74BP	EHV AC and DC Transmission systems	3	0	0	3	50	50	100
3	17153E74CP	Fiber Optics and Laser Instruments	3	0	0	3	50	50	100
4	17153E74DP	Advanced Control systems	3	0	0	3	50	50	100

17148S11P-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

3 1 0 4

(Common to all)

SEMESTER-1

UNIT I FOURIER SERIES

9 + 3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM

9 + 3hrs

Fourier integral theorem (without proof) – Sine and Cosine transforms – Properties (without Proof) – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier transform, Sine and Cosine transform.

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS

9 + 3hrs

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z –transform- Sampling of signals –an introduction.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS

9 + 3hrs

Formation of pde –solution of standard type first order equation- Lagrange's linear equation – Linear partial differential equations of second order and higher order with Constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS

9 + 3hrs

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

Total no of hrs: 60hrs

TEXT BOOKS

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillan, New York, 1988.
2. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCE BOOKS

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramanaiah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
3. Advanced Modern Engineering mathematics – Glyn James

17153H12P - CONTROL SYSTEM

3 1 0 4
SEMESTER-1

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

- i. To understand the methods of representation of systems and getting their transfer function models.
- ii. To provide adequate knowledge in the time response of systems and steady state error analysis.
- iii. To give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- iv. To understand the concept of stability of control system and methods of stability analysis.
- v. To study the three ways of designing compensation for a control system.

UNIT I: INTRODUCTION

12

Open-loop and closed-loop systems, servomechanisms and regulator systems; Transfer function; Block diagram reduction, Signal flow graphs.

UNIT II: MATHEMATICAL MODELS OF PHYSICAL SYSTEMS

12

Mechanical systems - Translational and Rotational systems, Gear trains, Electrical systems, Thermal systems and Fluid systems.
Components of feedback control systems - Potentiometers as error sensing devices, Synch, Servomotors, Stepper motors, Tachogenerators.

UNIT III: STABILITY

12

Concept of Stability, necessary and sufficient conditions of Stability, Closed-loop systems, merits and demerits, Routh-Hurwitz Criterion.
Transient Response: Typical inputs, convolution integral, Time domain specifications, steady state errors.
State equation – Solutions – Realization – Controllability – Observability – Stability
Jury's test.

UNIT IV: FREQUENCY RESPONSE

12

Definition, equivalence between transient response and frequency response, Bode plots. Nyquist Stability Criterion: Development of criterion, gain and phase margins, m- circles and Nichol's chart.

UNIT V: ROOT LOCUS METHOD

12

Rules for sketching of root loci, Root contours.
Synthesis: Lag and Lead networks, proportional, derivative and integral controllers.

MULTI INPUT MULTI OUTPUT (MIMO) SYSTEM:

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

Total = 60

TEXT BOOK:

1. I.J.Nagrath and M.Gopal, 'Control System Engineering', Wiley Eastern Ltd., Reprint 1995.

REFERENCES:

1. M.Gopal, 'Control System Principles and Design', Tata McGraw Hill, 1998.
2. Ogatta, 'Modern Control Engineering', Tata McGraw Hill 1997.

17153H13P - CIRCUIT ANALYSIS AND NETWORKS

3104

AIM

SEMESTER-1

To know about basic analysis and synthesis techniques used in electronics and communications.

OBJECTIVES

- To study about various network theorems and the method of application to analyse a circuit.
- To know the concept of transfer function of a network and the nature of response to external inputs.
- To synthesize a network in different forms from the transfer function.
- To know the concept and design of frequency selective filters.

UNIT-I BASIC CIRCUIT CONCEPTS & SINUSOIDAL ANALYSIS (12hrs)

Linear passive circuit elements, ideal sources (independent and dependent), V-I relationship of circuit elements – Ohm's Law - Kirchoff's Laws – analysis of series and parallel circuits – network reduction: voltage and current division, source transformation, star/delta transformation Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (volt -ampere), power factor– phasor diagram, impedance triangle and power triangle associated with these circuits – resonance in series and parallel circuits

UNIT-II CIRCUIT ANALYSIS & NETWORK THEOREMS (12hrs)

Formation of matrix equations and analysis by using Mesh-current and Node-voltage methods. Superposition theorem – Thevenin's theorem – Norton's theorem - Maximum power transfer theorem - Reciprocity theorem – Compensation theorem – Substitution theorem - Millman's theorem and Tillage's theorem with applications.

Coupled circuits: self inductance - mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits. Equivalent inductance of the series aiding and opposing, parallel aiding and opposing coupled circuits.

UNIT-III THREE PHASE CIRCUIT AND TRANSIENT ANALYSIS (12hrs)

Three-phase systems – phase sequence - Solution of three-phase balanced circuits (Star & Delta) – Solution of three-phase unbalanced circuits (Star & Delta) - Power measurement and two-wattmeter method.

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

UNIT-IV TWO PORT NETWORKS (12hrs)

Characterization of two port networks in terms of Z, Y, H and T parameters – networks equivalents – relations between network parameters – Analysis of T, Ladder, Bridged-T and lattice networks – transfer function of terminated two port networks.

UNIT-V NETWORK TOPOLOGY, FILTERS & ATTENUATORS (12hrs)

Network graphs, tree and cut – sets – tie set and cut – set schedules – primitive impedance and admittance matrices

Classification of Filters - filter networks - design of constant K, m-derived and composite filters. Analysis of T, π , lattice, bridged-T, and L type attenuators.

TOTAL 60

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering – Muthu subramaniyam
2. Nageswara rao
3. Umesh sinha
4. Charavarthi
1. Sudhakar. A., and Shyammohan, “Circuits and Networks Analysis and Synthesis” Tata McGraw Hill Publishing Co.Ltd. New Delhi, 1994.
2. Roy Choudhury, “Networks and Systems”, New Age International Ltd.

17153H14P- ELECTRONIC CIRCUITS

3 0 0 3
SEMESTER-1

AIM:

To study the characteristics and applications of electronic devices.

OBJECTIVES:

- To acquaint the students with construction, theory and characteristics of the following electronic devices:
- Bipolar transistor, Field Effect transistor, Multivibrators, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I -RECTIFIER & POWER SUPPLY

12

Half & Full wave rectifier – filters – shunt , inductor, LC section & Ripple factor, P calculation for C, L and LC filters – Voltage regulators – Zener –Series voltage regulator – SMPS.

UNIT II- AMPLIFIERS

12

Amplifiers – Frequency response of RC coupled - Frequency Response of Emitter follower, gain band width product – FET amplifier at low and high frequency cascaded amplifiers.

UNIT III- FEEDBACK AMPLIFIER & OSCILLATORS

12

Four basic types of feedback – effect of feedback on amplifier performance – condition for oscillation – Barkhausen criteria – LC oscillators – Hartley & Colpitts – RC oscillators – Wein bridge, RC phase shift crystal oscillator.

UNIT IV- MULTIVIBRATORS

12

Collector coupled & Emitter coupled Astable multivibrator – Monostable, Bistable multivibrator – triggering methods – Storage delay and calculation of switching time – Schmitt triggering circuits – Speed up capacitor in switching.

UNIT V- POWER AMPLIFIER

12

Classification – class A, B, C & AB – Class B push pull – Class B Complimentary – symmetry – Class S, Power sections classification – Efficiency – Distortion in amplifiers.

L = 45 T = 15 P = 0 TOTAL =60

REFERENCE BOOKS:

1. David.A.Bell, “Solid State Pulse Circuits”, Prentice Hall of India, 4th Edition, 2001.
2. Millman Taub.H, “Pulse Digital & Switching waveform”, Tata McGraw Hill International 2001.
3. Jacob Millman Cristas C.Halkias, “Integrated Electronics”, Tat Mc Graw Hill, Edition 1991.

AIM**SEMESTER-1**

To expose the students to the concepts of electromechanical energy conversions in D.C. Machines and energy transfer in transformers and to analyze their performance.

OBJECTIVES

- i. To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.
- ii. To understand the generation of D.C. voltages by using different type of generators and study their performance.
- iii. To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.
- iv. To familiarize with the constructional details of different type of transformers, working principle and their performance.
- v. To estimate the various losses taking place in D.C. machines and transformers and to study the different testing method to arrive at their performance.

UNIT I: BASIC PRINCIPLES OF ROTATING MACHINES**12**

Electrical machine types – Magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits - core losses. Principles of Electromechanical energy conversion: Energy conversion process – Energy in magnetic system – Field energy and mechanical force – Multiply excited magnetic field systems

UNIT II: GENERATORS**12**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNIT III: DC MOTORS**12**

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

UNIT IV: TRANSFORMERS**12**

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio - Equivalent circuit – Losses – Testing – Efficiency and Voltage regulation .

Transformer on load– Parallel operation of single phase transformers – Auto transformer – Three phase transformers

UNIT V: TESTING OF TRANSFORMERS AND DC MACHINES**12**

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

TOTAL = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J .B.Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.
4. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and Company Ltd, third edition, 2003.

17148S21P-NUMERICAL METHODS

3 1 0 4
Semester II

UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3hrs

Solution of equations–Newton Raphson’s method, Regula-falsi methods Solution of linear System of equations by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods– Eigenvalue of a matrix by power method.

UNIT II- INTERPOLATION

9+3hrs

Newton’s forward and backward difference formulas – Central difference formula: Bessels and Stirling’s formula - Lagrangian Polynomials – Divided difference method.

UNIT III- NUMERICAL DIFFERENTIATION AND INTEGRATION

9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Double integrals using trapezoidal and Simpson’s rules.

UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9+3hrs

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne’s and Adam’s predictor and corrector methods.

UNIT V - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

9+3hrs

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total no of hrs: 60hrs

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, “Applied Numerical Analysis”, Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., “Numerical Methods”, S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES BOOKS

1. Burden, R.L and Faires, T.D., “Numerical Analysis”, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., “Numerical Methods”, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

17150S22P- COMPUTER ARCHITECTURE

3 0 0 3
SEMESTER II

AIM:

To understand the architecture of different processor and its associative units

OBJECTIVES:

To provide a clear understanding of

- Computer arithmetic and logic unit design.
- Control Mechanism and CPU functioning.
- Pipeline architecture and vector processing.
- Input and output organizations and interfacing.
- Various memories and their organization.

UNIT I BASIC STRUCTURE OF COMPUTERS

9

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – hardware – software interface – addressing modes – instruction set – RISC – CISC – ALU design – fixed point and floating point operation.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT

9

Micro programmed control – Control memory, address sequencing, micro program example, and design of control unit. Central processing unit – general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING

9

Computer arithmetic – addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations decimal arithmetic unit, decimal arithmetic operations. Pipeline and vector processing – Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing array processors.

UNIT IV INPUT OUTPUT ORGANIZATION

9

Input output organization : peripheral devices, input output interface, asynchronous data transfer , modes of transfer, priority interrupt, direct memory access, input output interface, serial communication.

UNIT V MEMORY ORGANIZATION

9

Memory organization – memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Morris Mano, 'Computer system architecture', 3rd edition, Pearson education 2002
2. Behrooz Parhami, 'Computer Architecture', Oxford University Press, 2005.

REFERENCES:

1. Vincent P. Heuring and Harry F. Jordan, ' Computer systems design and architecture', Pearson Education Asia Publications, 2004.
2. John P. Hayes , ' Computer Architecture and Organization', Tata McGraw-Hill, 1988.
3. Andrew S Tannenbaum ' Structured Computer Organization ', 5th edition Pearson Education 2007.
4. William Stallings ,' Computer Organization and architecture', 7th edition Pearson Education 2006.

17153H23P-ELECTRICAL MACHINES-II**3 1 0 4****AIM:**

To expose the students to the concepts of synchronous and asynchronous machines and analyze their performance.

OBJECTIVES:

To impart knowledge on

- i. Construction and performance of salient and non – salient type synchronous generators.
- ii. Principle of operation and performance of synchronous motor.
- iii. Construction, principle of operation and performance of induction machines.
- iv. Starting and speed control of three-phase induction motors.
- v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I: SYNCHRONOUS GENERATOR**12**

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

UNIT II: SYNCHRONOUS MOTOR**12**

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

UNIT III: THREE PHASE INDUCTION MOTOR**12**

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors

UNIT IV: STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**12**

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

UNIT V: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINE**12**

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test — Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor

Total = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.

17153H24P-DIGITAL ELECTRONICS**3 1 0 4****AIM:**

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES:

- i. To study various number systems and to simplify the mathematical expressions using Boolean functions simple problems.
- ii. To study implementation of combinational circuits
- iii. To study the design of various synchronous and asynchronous circuits.
- iv. To expose the students to various memory devices.

UNIT I NUMBER SYSTEMS**12**

Review of Binary, Octal and Hexa-decimal number systems – Conversions, Binary Arithmetic magnitude form – 1's, 2's complement representation, Codes: -BCD, Excess – 3, Graycode, ASCII codes, Error detecting codes (Hamming code)

UNIT II BOOLEAN ALGEBRA**12**

Boolean Algebra - De Morgan's law – Simplifications of Boolean expression – sum of Products and product of sums – Karnaugh Map – Quince McClusky method of simplification (Including Don't care conditions)

UNIT III Combinational Logic**12**

Design of Logic gates- Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT IV Sequential Logic Design**12**

Building blocks of Sequential logic – RS, JK, Master – Slave, D and T flip- flop, Asynchronous and synchronous counters – Binary and BCD counters – shift registers – Design and Implementation of Sequential synchronous circuits

UNIT V Logic Families

12

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TOTAL = 60Hrs

TEXT BOOK:

1. Albert Paul, Malvino and Donald.P.Leach , “Digital Principles and Applications”, McGraw Hill Publications.
2. Floyd, “Digital Fundamentals”, Universal Book Stall, New Delhi,1993.
3. Moris Mano, “Digital Electronics and Design “, Prentice Hall of India, 2000.

REFERENCE:

1. “Digital Logic & Computer Design”, Prentice Hall of India, 2000.

17153H25P-TRANSMISSION AND DISTRIBUTION

4 0 0 4

Semester II

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

- i. To develop expression for computation of fundamental parameters of lines.
- ii. To categorize the lines into different classes and develop equivalent circuits for these classes.
- iii. To analyze the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I: INTRODUCTION

12

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability.

Radial and ring-main distributors; interconnections; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

UNIT II: TRANSMISSION LINE PARAMETERS

12

Resistance, Inductance and Capacitance of single and three phase transmission lines - Stranded and Bundled conductors -Symmetrical and unsymmetrical spacing - Transposition -Application of self and mutual GMD -Skin and Proximity effect - Inductive interference with neighboring circuits.

UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES

12

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV: INSULATORS AND CABLES

12

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V: DESIGN OF TRANSMISSION LINES

12

Introduction, calculation of sag and tension .Equivalent span length and sag, Effect of ice and wind loading ,Stringing chart, sag template, conductor vibrations and vibrations dampers

TOTAL =60

TEXT BOOKS

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice

Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCE BOOKS

1. Lucas M.Fualkenberry ,Walter Coffey, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

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17148S31P-PROBABILITY AND STATISTICS

3 1 0 4

(Common to Mech, Civil, EEE)

SEMESTER-III

UNIT I PROBABILITY AND RANDOM VARIABLE

9+3hrs

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties - Moments - Moment generating functions and their properties.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES

9+3hrs

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT III STANDARD DISTRIBUTIONS

9+3hrs

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

UNIT IV TESTING OF HYPOTHESIS

9+3hrs

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS

9+3hrs

Analysis of variance – One way classification – Complete randomized design - Two – way classification – Randomized block design - Latin square.

Note : Use of approved statistical table permitted in

Total no of hrs: 60hrs

TEXT BOOKS

1. Ross. S., “A first Course in Probability”, Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES BOOKS

- 1) Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K., “Probability and Statistics for Engineers and Scientists”, Seventh Edition, Pearsons Education, Delhi, 2002.
- 2) Lipschutz. S and Schiller. J, “Schaum’s outlines - Introduction to Probability and Statistics”, McGraw-Hill, New Delhi, 1998.
- 3) Gupta, S.C, and Kapur, J.N., “Fundamentals of Mathematical Statistics”, Sultan Chand, Ninth Edition , New Delhi ,1996.

17152S32P- ANALOG INTEGRATED CIRCUITS 3 1 0 4**AIM**

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of Ics.

OBJECTIVES

- i. To study the IC fabrication procedure.
- ii. To study characteristics; realize circuits; design for signal analysis using Op-amp Ics.
- iii. To study the applications of Op-amp.
- iv. To study internal functional blocks and the applications of special Ics like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I: IC FABRICATION**9**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic Ics and packaging.

UNIT II: CHARACTERISTICS OF OPAMP**9**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer and subtractor – Multiplier and divider- differentiator and integrator.

UNIT III: APPLICATIONS OF OPAMP**9**

Instrumentation amplifier, V/I & I/V converters, comparators, multivibrators, waveform generators, Precision rectifier, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter – Dual slope, successive approximation and flash types.

UNIT IV: ACTIVE FILTERS AND SPECIAL ICs**9**

RC Active filters : low pass – high pass – band pass – band reject – switched capacitor filter – 555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier Ics.

UNIT V: APPLICATION ICs**9**

IC voltage regulators – LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic Ics.

TOTAL = 45**TEXT BOOKS**

1. Ramakant A.Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2003 / PHI.

2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.

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17153H33P- POWER ELECTRONICS**4 0 0 4****AIM:**

To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

OBJECTIVES:

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.

UNIT I- POWER SEMI-CONDUCTOR DEVICES :**12**

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

UNIT II-PHASE CONTROLLED CONVERTERS**12**

2 pulse / 3 pulse and 6 pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters.

UNIT III -DC TO DC CONVERTERS**12**

Stepdown and stepup chopper – Forced commutation techniques – Time ratio control and current limit control – Switching mode regulators Buck, Boost, Buck-Boost – concept of resonant switching.

UNIT IV- INVERTERS**12**

Single phase and three phase [120° & 180° mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM – Voltage and harmonic control – Series resonant inverter – current source inverter.

UNIT V- AC TO AC CONVERTERS**12**

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverters – power factor control – Matrix converters.

L: 45 T: 15 TOTAL: 60 PERIODS**TEXT BOOKS:**

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.

2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

17153H34P-MEASUREMENTS AND INSTRUMENTATION

4004

Semester III

AIM

To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.

- i. Introduction to general instrument system, error, calibration etc.
- ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- iii. To have an adequate knowledge of comparison methods of measurement.
- iv. Elaborate discussion about storage & display devices.
- v. Exposure to various transducers and data acquisition system.

UNIT I: INTRODUCTION 10

Functional elements of an Instrument -Static and Dynamic characteristics -Errors in measurement -Statistical evaluation of measurement data -Standard and Calibration.

UNIT II: ELECTRICAL AND ELECTRONICS INSTRUMENTS 12

Construction and principle of operation of moving coil, moving Iron, Principle and types analog and digital ammeters and voltmeters -Single and three phase Wattmeter and Energy meter - magnetic measurements - -Instruments for measurement of frequency and phase.

UNIT III: SIGNAL CONDITIONING CIRCUITS 12

Bridge circuits – Differential and Instrumentation amplifiers -Filter circuits - V/f and f/V converters – P/I and I/P converters – S/H Circuit, A/D and D/A converters -Multiplexing and De-multiplexing -Data acquisition systems –Grounding techniques.

UNIT IV: STORAGE AND DISPLAY DEVICES 12

Magnetic disc and Tape Recorders -Digital plotters and printers -CRT displays -Digital CRO – LED, LCD and Dot matrix displays.

UNIT V: TRANSDUCERS 14

Classification of Transducers -Selection of Transducers –Resistive, Capacitive and Inductive Transducers -Piezo electric Transducers -Transducers for measurement of displacement, temperature, level, flows, pressure, velocity, acceleration, torque, speed, viscosity and moisture.

Total = 60

TEXT BOOKS

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2003.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 1995.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.

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17153L35P- MACHINES LAB

0 0 3 2

Semester III

LIST OF EXPERIMENTS

1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

TOTAL: 45

17153H41P- PROTECTION AND SWITCHGEAR

4 0 0 4

AIM

To expose the students to the various faults in power system and learn the various methods of protection scheme.

To understand the current interruption in Power System and study the various switchgears.

OBJECTIVES

- i. Discussion on various earthing practices usage of symmetrical components to estimate fault current and fault MVA.
- ii. Study of Relays & Study of protection scheme, solid state relays.
- iii. To understand instrument transformer and accuracy.
- iv. To understand the method of circuit breaking various arc theories Arcing phenomena – capacitive and inductive breaking.
- v. Types of circuit breakers.

UNIT I: INTRODUCTION

12

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNIT II: OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS

12

Need for protection – essential qualities of protective relays – Electromagnetic relays, Induction relays – Over current relays - Directional, Distance, Differential and negative sequence relays. Static relays

UNIT III: APPARATUS PROTECTION

12

Apparatus protection transformer, generator, motor, protection of bus bars, transmission lines – CTs and PTs and their applications in protection schemes.

UNIT IV: THEORY OF CIRCUIT INTERRUPTION

12

Physics of arc phenomena and arc interruption. Restricting voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNIT V: CIRCUIT BREAKERS

12

Types of Circuit Breakers – Air blast, Air break, oil SF₆ and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers

TEXT BOOKS

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

REFERENCE BOOKS

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2001.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

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17153H42P-HIGH VOLTAGE DC TRANSMISSION

3 1 0 4

Semester IV

AIM:

To learn the HVDC modelling and control strategy.

OBJECTIVES:

- To study the performance of converters and modeling of DC line with controllers.
- To study about converter harmonics and its mitigation using active and passive filters.

UNIT I- DC POWER TRANSMISSION TECHNOLOGY 9

Introduction-comparison of AC and DC transmission application of DC transmission – Description of DC transmission system planning for HVDC transmission-modern trends In DC transmission.

UNIT II- ANALYSIS OF HVDC CONVERTERS 9

Pulse number, choice of converter configuration-simplified analysis of Graetz circuit converter bridge characteristics – characteristics of a twelve pulse converter-detailed analysis of converters.

UNIT III- CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control-converter control characteristics-system control Hierarchy-firing angle control-current and extinction angle control-starting and stopping of DC link-power control-higher level controllers-telecommunication requirements.

UNIT IV -HARMONICS AND FILTERS 9

Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency and RI noise.

UNIT V -SIMULATION OF HVDC SYSTEMS 9

Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Padiyar, K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi 1990. First edition.
2. P.Kundur, 'Power System Stability and Control', Tata McGraw Hill Publishing Company Ltd., USA, 1994.
3. Arrillaga, J., High Voltage direct current transmission, Peter Pregrinus, London, 1983.

REFERENCES:

1. Edward Wilson Kimbark, Direct Current Transmission, Vol. I, Wiley interscience, New York, London, Sydney, 1971.
2. Rakosh Das Begamudre, Extra high voltage AC transmission engineering New

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

17153H43P- SOLID STATE DRIVES

3 1 0 4

Semester IV

AIM

To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

- i. To understand the stable steady-state operation and transient dynamics of a motor-load system.
- ii. To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
- iii. To study and understand the operation of both classical and modern induction motor drives.
- iv. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- v. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive.

UNIT I DRIVE CHARACTERISTICS

9

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II DC MOTOR DRIVE

9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III STATOR CONTROLLED INDUCTION MOTOR DRIVES

9

Variable terminal voltage control – Variable frequency control – V/f control - AC voltage controllers – Four-quadrant control and closed loop operation - Frequency controlled drives- VSI and CSI fed drives – closed loop control.

UNIT IV ROTOR CONTROLLED INDUCTION MOTOR DRIVES

9

Rotor resistance control – slip power recovery schemes - sub synchronous and super synchronous operations – closed loop control – Braking in induction motors.

UNIT V- SYNCHRONOUS MOTOR DRIVES

9

Wound field cylindrical rotor motor – operation from constant voltage and frequency source – operation from current source – operation from constant frequency – Brushless excitation – Permanent magnet synchronous motor.

Self-controlled Synchronous motor drives – Brushless dc and ac motor drives – CSI with load commutation – Cycloconverter with load commutation.

TOTAL = 45

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.
2. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

REFERENCE BOOKS

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.
2. Vedam Subrahmanyam, "Electric drives concepts and applications", TMH Pub. Co.Ltd., 1994.
3. Murphy, J.M.D and Turnbull.F.G. , "Thyristor control of AC Motors", Pergamon Press, 1988.
4. Sen. P.C., "Thyristor D.C. Drives", John Wiley and Sons, 1981.

AIM

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems and To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of a DC servo motor & AC servo motor.
2. Analog simulation of type-0 and type-1 system, closed loop control system.
3. Digital simulation of linear systems & non-linear systems.
4. Design of P, PI and PID controllers,
5. Design of compensators.
6. Stability analysis of linear systems
7. Conduct test to find unknown inductance & capacitance using Maxwell's & Schering's bridges
8. Conduct test to find unknown Resistance using Wheat Stone & Kelvin's bridges.
9. Instrumentation amplifiers,
10. Conduct test to convert A/D signal using successive approximation type.
11. a) Conduct test to convert D/A signal using binary weighted resistor method.
b) Conduct test to convert D/A signal using R-2R Ladder method.
12. Calibration of single-phase energy meter & current transformer.

P = 45 Total = 45

17153H51P-POWER SYSTEM ANALYSIS

3 1 0 4
Semester V

AIM

To become familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

OBJECTIVES

- i. To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
- ii. To model and analyse power systems under abnormal (fault) conditions.
- iii. To model and analyse the dynamics of power system for small-signal and large signal disturbances and to design the systems for enhancing stability.

UNIT I- THE POWER SYSTEM AN OVER VIEW AND MODELLING 12

Modern Power System - Basic Components of a power system - Per Phase Analysis
Generator model - Transformer model - line model. The per unit system -Change of base.

UNIT II- POWER FLOW ANALYSIS 12

Introduction - Bus Classification - Bus admittance matrix - Solution of non-linear Algebraic equations - Gauss seidal method - Newton raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III-FAULT ANALYSIS-BALANCED FAULT 12

Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of the bus impedance matrix.

UNIT IV-FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND UNBALANCED FAULT 12

Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V-POWER SYSTEM STABILITY 12

Dynamics of a Synchronous machine – Swing equation and Power angle equation – Steady state Stability and Transient state Stability - Equal area criterion – Clearing angle and time- Numerical solution of Swing equation for single machine

Total = 60 Hrs

TEXT BOOKS:

1. Hadi Saadat “Power system analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, “Power System Stability and Control”, Tata McGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCE BOOKS:

1. I.J.Nagrath and D.P.Kothari, 'Modern Power System Analysis', Tata McGraw-Hill publishing company, New Delhi, 1990.
2. M.A. Pai, 'Computer Techniques in power system Analysis', Tata McGraw – Hill publishing company, New Delhi, 2003.
3. John J. Grainger and Stevenson Jr. W.D., 'Power System Analysis', McGraw Hill International Edition, 1994

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UNIT I INTRODUCTION TO POWER QUALITY 3

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES 10

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables.

UNIT IV HARMONICS 12

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 17

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic/spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L=45 Total=45**REFERENCE BOOKS**

1. Roger.C.Dugan, Mark.F.McGranaghan, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCAD User Manual.

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AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of synchronous reluctance motors.
- ii. Construction, principle of operation and performance of stepping motors.
- iii. Construction, principle of operation and performance of switched reluctance motors.
- iv. Construction, principle of operation and performance of permanent magnet brushless D.C. motors.
- v. Construction, principle of operation and performance of permanent magnet synchronous motors.

UNIT I-SYNCHRONOUS RELUCTANCE MOTORS**9**

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.

UNIT II -STEPPING MOTORS**9**

Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits.

UNIT III-SWITCHED RELUCTANCE MOTORS**9**

Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control - characteristics – computer control.

UNIT IV-PERMANENT MAGNET BRUSHLESS D.C. MOTORS**9**

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

UNIT V-PERMANENT MAGNET SYNCHRONOUS MOTORS**9**

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

L=45 Total=45**TEXT BOOKS**

1. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
2. Aearnley, P.P., 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCES

1. Kenjo, T., 'Stepping Motors and their Microprocessor Controls', Clarendon Press London, 1984.
2. Kenjo, T., and Nagamori, S., 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.

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17153L55P- POWER ELECTRONICS AND DRIVES LAB

Semester V

0 0 3 2

AIM

To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

1. Study Of V-I Characteristics Of An SCR.
2. Study Of V-I Characteristics Of A TRIAC.
3. Study Of Different Trigerring Circuits For Thyristor.
4. Study Of Uni- Junction Transistor (UJT) Trigerring Circuit.
5. Study Of A Firing Circuit Suitable For Single Phase Half Controlled Convertor.
6. Simulation On the Single Phase Ac-Dc Uncontrolled Convertor with & without the source Inductance.
7. Simulation Of A Single Phase Ac To Controlled Dc Convertor with & without the source Inductance.
8. Single Phase Half Controlled Bridge Convertor With Two Thyristors & Two Diodes.
9. Single Phase Fully Controlled Bridge Convertor Using Four Thyristors.
10. Pspice or MATH LAB Simulation Of Dc to Dc Step Down Chopper.
11. Pspice or MATH LAB Simulation Of Single Phase Controller with R-L Load.
12. Pspice or MATH LAB Simulation Of PWM Bridge Invertor Of R-L Load Using MOSFET.

17153H61P- UTILIZATION OF ELECTRICAL ENERGY

3 1 0 4
Semester VI

AIM

To plan and design using basic principles and handbooks
To select equipment, processes and components in different situations.

OBJECTIVES

- i. To ensure that the knowledge acquired is applied in various fields as per his job requirements.
- ii. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize with the new developments in different areas.

UNIT I ELECTRIC LIGHTING

12

Production of light – Definition of terms – Lighting calculations – Types of lamps – Interior and Exterior illumination systems – Lighting schemes – Design of Lighting schemes – Factory lighting – Flood lighting – Energy saving measures.

UNIT II ELECTRIC HEATING

12

Resistance heating – Induction heating – Dielectric heating – Arc furnace – Control equipment, efficiency, and losses – Energy conservation in Arc Furnace Industry.

UNIT III ELECTRIC WELDING

12

Welding equipment – Characteristics of carbon and metallic arc welding – Butt welding – Spot welding – Energy conservation in welding.

UNIT IV ELECTRIC VEHICLE

12

Traction: System of track electrification, train movement and energy consumption (speed time curves, crest speed, average speed and schedule speed) rective effort, factors affecting energy consumption (dead weight, acceleration weight and adhesion weight) starting and braking of traction motors, protective devices

UNIT V ELECTRO CHEMICAL PROCESS

12

Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, efficiency – Batteries – Types – Charging methods.

Total = 60

Text Books:

1. Tripathy,S.C., “Electric Energy Utilization & Conservation” – Tata McGraw Hill Publishing Company.
2. Uppal,S.L., “Electric Power”, Khanna Publishers.
3. Soni,M.L., P.V.Gupta & Bhatnagar , “A course in Electric Power”, Dhanpat Rai & Sons.

Reference Books:

1. Partab,H., “Art & Science Utilization of Electrical Energy” – Dhanpat Rai & Sons.
2. Wadhwa,C.L., “Generation, Utilization & Distribution” - Wilsey Eastern Ltd.
3. Wadha C L - Utilization of Electric Power; New Age International
4. Suryanarayana . N.V., “Utilization of Electric Power” - Wilsey Eastern Ltd.

UNIT 1	9
Advantages of Static Relays – Generalized Characteristics and Operational Equations of Relays – Steady State and Transient Performance of Signal Driving Elements – Signal Mixing Techniques and Measuring Techniques – CT’s and PT’s in Relaying Schemes – Saturation Effects.	
UNIT 2	9
Static Relay Circuits (Using Analog and Digital IC’s) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.	
UNIT 3	9
Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.	
UNIT 4	9
Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.	
UNIT 5	9
Microprocessor Based Relays – Hardware and Software for the Measurement of Voltage, Current, Frequency, Phase Angle – Microprocessor Implementation of Over Current Relays – Inverse Time Characteristics – Impedance Relay – Directional Relay – MHO Relay.	

Total=45**Text Books:**

1. Badriram and Vishwakarma D.N., Power System Protection and Switchgear, Tata McGraw Hill, New Delhi, 1995.
2. Rao T.S.M., Power System Protection – Static Relays, McGraw Hill, 1979.

Reference Books:

1. Van C.Warrington, “Protection Relays – Their Theory and Practice”, Chapman and Hall.
2. Ravindranath B. and Chander M., “Power System Protection and Switchgear”, Wiley Eastern, 1992.
3. Russel C.Mason, “The Art and Science of Protective relays”.

17153H63P- POWER SYSTEM OPERATION AND CONTROL

4 0 0 4
Semester VI

AIM

To become familiar with the preparatory work necessary for meeting the next day's operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVES

- i. To get an overview of system operation and control.
- ii. To understand & model power-frequency dynamics and to design power-frequency controller.
- iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNIT I INTRODUCTION 12

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 12

Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC of single & Multi areas - Static & Dynamic Analysis of uncontrolled and controlled cases - Tie line with frequency bias control - Steady state instabilities.

UNIT III REACTIVE POWER-VOLTAGE CONTROL 12

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ -iteration method. (No derivation of loss coefficients.) Base point and participation factors.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies. **Total = 60**

TEXT BOOKS

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
3. P. Kundur, 'Power System Stability & Control', McGraw Hill Publications, USA, 1994.

REFERENCE BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

AIM

To simulate analysis and planning cases for a practical power system.

List Of Experiments:

1. Formation of Y-Bus Matrix by Inspection and Singular transformation methods.
2. Load flow solution using Gauss Seidal method
3. Load flow solution using Newton-Raphson method
4. Load flow solution by Fast Decoupled method
5. Symmetrical short circuit analysis
6. Unsymmetrical Fault analysis
7. Solution of swing Equation using modified Euler method
8. Power Electronic Circuits, design and simulation using Pspice
9. Simulation of Electrical drives using MATLAB, PSCAD
10. Control system design using MATLAB

Total = 45

P = 45

17160S71P TOTAL QUALITY MANAGEMENT 3 0 0 3**UNIT – I: BASICS OF TQM 9**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT – II: PRINCIPLES OF TQM 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT – III: QUALITY CONCEPTS 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Concept of six sigma.

UNIT – IV: TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages of FMEA.

UNIT – V: ISO STANDARDS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45**TEXT BOOKS:**

1. Dale H. Besterfield, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker, “TOTAL QUALITY MANAGEMENT”, Anuradha Agencies.

REFERENCES:

1. Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.
2. Oakland.J.S. “Total Quality Management”, Butterworth – Heinemann Ltd., Oxford. 1989.
3. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age International 1996

17153H72P- ELECTRICAL MACHINE DESIGN 3 1 0 4
Semester VII

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of DC machine.
- ii. Construction, operating Characteristics of single and three phase transformer.
- iii. Design and operating characteristics of Induction motors.
- iv Construction, principle of operation, Design of synchronous machines and to have knowledge of machine design in CAD

UNIT I INTRODUCTION 12

Major considerations – Limitations – Electrical Engineering Materials – Space factor – temperature gradient – Heat flow in two dimensions – thermal resistivity of winding – Temperature gradient in conductors placed in slots – Rating of machines – Eddy current losses in conductors – Standard specifications

UNIT II DC MACHINES 12

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes – losses and efficiency calculations.

UNIT III TRANSFORMERS 12

KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise of Transformers – Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 12

Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current – Output equation of Induction motor – Main dimensions –Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor-Operating characteristics –Short circuit current – circle diagram – Dispersion co-efficient – relation between D & L for best power factor.

UNIT V SYNCHRONOUS MACHINES**12**

Runaway speed – construction – output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor – Design of damper winding – Determination of full load field m.m.f – Design of field winding – Design of turbo alternators – Rotor design - Introduction to computer aided design – Program to design main dimensions of Alternators.

Total = 60**REFERENCE BOOKS:**

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

17153H73P- POWER PLANT ENGINEERING

4 0 0 4
Semester VII

UNIT I -THERMAL POWER PLANTS 9

Basic thermodynamic cycles – Various components of steam power plant – Layout – Pulverized coal burners – Fluidized bed combustion – Coal handling systems – Ash handling systems – Forced draft and induced draft fans – Boilers – Feed pumps – Super heater – Regenerator – Condenser – Deaerators – Cooling tower

UNIT II - HYDRO ELECTRIC POWER PLANTS 9

Layout – Dams – Selection of water turbines – Types – Pumped storage hydel plants

UNIT III - NUCLEAR POWER PLANTS 9

Principles of nuclear energy – Fission reactions – Nuclear reactor – Nuclear power plants

UNIT IV- GAS AND DIESEL POWER PLANTS 9

Types – Open and closed cycle gas turbine – Work output and thermal efficiency – Methods to improve performance – Reheating, intercoolings, regeneration – Advantage and disadvantages – Diesel engine power plant – Component and layout

UNIT V- NON – CONVENTIONAL POWER GENERATION 9

Solar energy collectors – OTEC – Wind power plants – Tidal power plants and geothermal resources – Fuel cell – MHD power generation – Principle – hermoelectric power generation – Thermionic power generation.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Arora and Domkundwar, “A Course in Power Plant Engineering”, Dhanpat Rai.
2. Nag, P.K., “Power Plant Engineering”, 2nd Edition, Tata McGraw Hill, 2003.

REFERENCES

1. Bernhardt, G.A., Skrotzki and William A. Vopat, “Power Station Engineering and Economy”, 20th Reprint, Tata McGraw Hill, 2002.
2. Rai, G.D., “An Introduction to Power Plant Technology”, Khanna Publishers.
3. El-Wakil, M.M., “Power Plant Technology”, Tata McGraw Hill, 198

17153E44AP-FIELD THEORY3 1 0 4
Semester-IV**AIM**

To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering.

OBJECTIVES: To impart knowledge on

- i. Concepts of electrostatics, electrical potential, energy density and their applications.
- ii. Concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
- iii. Faraday's laws, induced emf and their applications.
- iv. Concepts of electromagnetic waves and Pointing vector.

UNIT I: INTRODUCTION**12**

Introduction-Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Electric flux density-Gauss's law and application – Electrical potential –potential gradient– Divergence & Divergence theorem- Poisson's and Laplace's equations

UNIT II: STATIC ELECTRI FIELD**12**

Field due to dipoles- dipole moment-current & current density-conductors and dielectric –boundary conditions– Capacitance-Dielectric Dielectric interface- capacitance of a system of conductors- Dielectric constant and dielectric strength- Energy stored in a capacitor- Energy density.

UNIT III: MAGNETOSTATICS**12**

Introduction- Biot-savart Law- Ampere's Circuital Law-Curl- Stoke's theorem-Magnetic flux- – Magnetic flux density (B)- Scalar and vector potential – Force on a moving charge and current elements- force & Torque on closed circuits.

UNIT IV: ELECTROMAGNETIC INDUCTION**12**

Introduction to magnetic materials – Magnetization and permeability- Magnetic Boundary conditions- Magnetic circuits-Potential energy and forces on magnetic materials.- Faraday's laws- Inductance & mutual inductance- Inductance of solenoid, toroid and transmission lines.

UNIT V: ELECTROMAGNETICS**12**

Conduction current and - Displacement current-, Maxwell's equations (differential and integral forms) -Wave propagation in free space, lossy and lossless dielectrics- Power and Poynting vector – Propagation in good conductors- wave polarization.

TOTAL = 60

TEXT BOOKS

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition, 1991.
2. William .H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.

REFERENCE BOOKS

1. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
4. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 1995.

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17152E44BP - FUZZY LOGIC AND ITS APPLICATIONS**3 1 0 4**

Semester-IV

UNIT I -FUZZY LOGIC**7**

Fuzzy sets – Fuzzy operation – Fuzzy arithmetic – Fuzzy relational equations – Fuzzy measure – Fuzzy functions – approximate reasoning – Fuzzy proposition – Fuzzy quantifiers-if-then rules.

UNIT II- FUZZY LOGIC IN CONTROL**8**

Structure of Fuzzy logic controller – Fuzzification models – database – rule base – inference engine – defuzzification modules – Non-Linear fuzzy control – PID like FLC – Sliding mode FLC – Sugeno FLC – adaptive fuzzy control applications – case studies.

UNIT III- NEURAL NETWORKS IN CONTROL**8**

Neural Network for Non-Linear systems – schemes of Neuro control-system identification forward model and inverse model – indirect learning neural network control applications – Case studies.

UNIT IV- MODELING AND CONTROL OF FACTS DEVICES NEURAL AND FUZZY TECHNIQUE**10**

FACTS-concept and general system considerations, types of FACTS devices – special purpose FACTS devices, generalized and multifunctional FACTS devices – General comments on transient stability programs. Neuro – Fuzzy based FACTS controller for improvement of Transient stability systems – GA for Adaptive fuzzy system – case study.

UNIT V- STABILITY STUDIES UNDER MULTIPLE FACTS ENVIRONMENT**12**

Introduction to small signal analysis – simulation and modeling of FACTS controllers for small signal analysis. Comparison between dynamic and transient stability results. Introduction to EMTP – (Electromagnetic Transient programme / Package), Modeling of FACTS controllers for power system studies using EMTP.

TOTAL=45**REFERENCES:**

1. KOSKO. B. “Neural Networks and Fuzzy systems”, Prentice-Hall of India Pvt.Ltd., 1994.
2. Driankov, Hellendroon, “Introduction to Fuzzy control” Narosa Publisher.
3. Ronald R.Yager and Dimitar P.Filev “Essential of fuzzy modeling and control “ John Wiley & Sons, Inc.
4. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho” FACTS – Modeling and simulation in Power Networks” John Wiley & Sons.
5. Kundur P., “Power system stability and control”, McGraw Hill, 1994.

17153E44CP - BIOMEDICAL INSTRUMENTATION**4 0 0 4****Semester-IV****AIM**

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

- i. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- ii. To introduce the student to the various sensing and measurement devices of electrical origin.
- iii. To provide the latest ideas on devices of non-electrical devices.
- iv. To bring out the important and modern methods of imaging techniques.
- v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I BASIC PHYSIOLOGY 9

Cells and their structures – Transport of ions through cell membrane – Resting and excited state – Tran membrane potential – Action potential – Bio-electric potential – Nervous system – Physiology of muscles – Heart and blood circulation – Respiratory system – Urinary system.

UNIT II BASIC TRANSDUCER PRINCIPLES AND ELECTRODES**9**

Transducer principles - Active transducers - Passive transducers -Transducer for Bio-medical application -Electrode theory- Bio-potential electrode - Bio - chemical transducer.

UNIT III CARDIOVASCULAR SYSTEM 9

The heart and cardiovascular system – Blood pressure – Characteristics of blood flow – Heart sounds - Electro cardiography – Measurements of blood pressure – Measurement of blood flow and cardiac O/P Plethysmography – Measurements of heart sounds.

UNIT IV X-RAY AND RADIOISOTOPE INSTRUMENTATION 9

X-ray imaging radiography – Fluoroscopy – Image intensifiers – Angiography - Medical use of radioisotopes – Beta radiations – Detectors – Radiation therapy.

UNIT V BIO-TELEMETRY 9

Introduction to biotelemetry – Physiological parameters adaptable to biotelemetry – the components of biotelemetry systems – Implantable units – Applications of telemetry in patient care – Application of computer in Bio-medical instrumentation, Anatomy of Nervous system – Measurement from the nervous system – EEG – EMG.

Total = 45

REFERENCE BOOKS:

1. Lesis Cromwell Fred, J.Werbell and Erich A.Pfaffer, Biomedical instrumentation and Measurements – Prentice Hall of India, 1990.
2. M.Arumugam, Bio-medical Instrumentation – Anuradha Agencies Publishers, 1992.
3. Khandpur, Handbook on Biomedical Instrumentation – Tata McGraw Hill Co Ltd., 1989.

17153E44DP - MODELING AND SIMULATION OF SOLAR ENERGY SYSTEMS

4 0 0 4

UNIT I: SOLAR RADIATION AND COLLECTORS

9

Solar angles - day length, angle of incidence on tilted surface - Sunpath diagrams - shadow determination - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT II: APPLICATIONS OF SOLAR THERMAL TECHNOLOGY

9

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying.

UNIT III: SOLAR PV FUNDAMENTALS

9

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetero junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell – efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells - preparation of metallurgical, electronic and solar grade Silicon - production of single crystal Silicon: Czochralski (CZ) and Float Zone (FZ) method - Design of a complete silicon – GaAs- InP solar cell - high efficiency III-V, II-VI multi junction solar cell; a-Si-H based solar cells-quantum well solar cell -thermophotovoltaics.

UNIT IV: SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS

9

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking – use of computers in array design - quick sizing method - array protection and trouble shooting - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT V: SOLAR PASSIVE ARCHITECTURE

9

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces -

passive cooling concepts: evaporative cooling - radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort – concept of solar temperature and its significance - calculation of instantaneous heat gain through building envelope.

TOTAL: 45

TEXT BOOKS:

1. Sukhatme S P, Solar Energy, Tata McGraw Hill, 1984.
2. Kreider, J.F. and Frank Kreith, Solar Energy Handbook, McGraw Hill, 1981.
3. Goswami, D.Y., Kreider, J. F. and Francis., Principles of Solar Engineering, 2000.

REFERENCES:

1. Garg H P., Prakash J., Solar Energy: Fundamentals & Applications, Tata BMcGraw Hill, 2000.
2. Duffie, J. A. and Beckman, W. A., Solar Engineering of Thermal Processes, John Wiley, 1991.
3. Alan L Fahrenbruch and Richard H Bube, Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press, 1983.
4. Larry D Partain, Solar Cells and their Applications, John Wiley and Sons, Inc, 1995.
5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2004.
6. Sodha, M.S, Bansal, N.K., Bansal, P.K., Kumar, A. and Malik, M.A.S. Solar Passive Building, Science and Design, Pergamon Press, 1986.
7. Krieder, J and Rabi, A., Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.

17158E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNIT I- INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineral resources: use and effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT II-ECOSYSTEMS AND BIODIVERSITY

14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem. Introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III -ENVIRONMENTAL POLLUTION

8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards — role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV-SOCIAL ISSUES AND THE ENVIRONMENT

7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management

environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. environment production act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

UNIT V-HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – hiv / aids – women and child welfare – role of information technology in environment and human health – case studies.

TOTAL : 45

TEXT BOOKS

1. Gilbert M .Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., Ahmedabad India.
2. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. “Environmental Management”, W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, “Essentials of Ecology, Blackwell Science.
6. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

17152E54BP -ARTIFICIAL NEURAL NETWORKS

4 0 0 4

UNIT I : INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 12

Biological neural networks - Pattern analysis tasks: Classification, Regression, Clustering
- Computational models of neurons - Structures of neural networks - Learning principles

UNIT II: LINEAR MODELS FOR REGRESSION AND CLASSIFICATION 12

Polynomial curve fitting - Bayesian curve fitting - Linear basis function models - Bias-variance decomposition - Bayesian linear regression - Least squares for classification - Logistic regression for classification- Bayesian logistic regression for classification

UNIT III: FEEDFORWARD NEURAL NETWORKS 12

Pattern classification using preceptor - Multilayer feed forward neural networks (MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back propagation learning - Fast learning methods: Conjugate gradient method – Auto associative neural networks - Bayesian neural networks

UNIT III: RADIAL BASIS FUNCTION NETWORKS 12

Regularization theory - RBF networks for function approximation - RBF networks for pattern classification

UNIT IV: KERNEL METHODS FOR PATTERN ANALYSIS 12

Statistical learning theory- Support vector machines for pattern classification- Support vector regression for function approximation- Relevance vector machines for classification and regression

UNIT V: SELF-ORGANIZING MAPS 12

Pattern clustering- Topological mapping- Kohonen's self-organizing map

FEEDBACK NEURAL NETWORKS

Pattern storage and retrieval- Hopfield model- Boltzmann machine- Recurrent neural networks

TOTAL=60

Text Books:

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999

2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

ELECTIVE-II
Semester-v

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

UNIT I 9

Need for Modulation, Amplitude Modulation, AM Demodulator, SSB Modulation, Vestigial Sideband Modulation, AM transmitter and Receiver, Noise and bandwidth in AM, Carrier Communication, Basic Principles of Pulsed and CW Radar.

UNIT II 9

Frequency Modulation, FM Demodulator, Phase Modulation, FM transmitter and receiver, Noise and bandwidth in FM, Ground wave, sky wave and space wave propagation, Basic Principles of BW and Colour TV.

UNIT III 9

Sampling theorem, PAM, PWM, PPM, Pulse Code Modulation, Noise in PCM, Delta Modulation, Adaptive Delta modulation, DPCM, M'ary system, FDM and TDM.

UNIT IV 9

Digital Modulation, ASK, FSK, PSK, DPSK, Basic Principles of Optical Communication, Satellite Comm., Mobile Comm.

UNIT V 9

Entropy, Mutual Information, Channel Capacity, Shannon Theorem, Shannon-Hartley Theorem, Shannon-Fano code, Huffman code, Parity Check Code, Hamming's Single Error Correction Code.

TOTAL 45**REFERENCE BOOKS:**

1. Electronics Communication System - G.Kennedy
2. Communication System-Analog & Digital - R.P.Singh & S.D.Sapre

ELECTIVE-II

Semester-v

17154E54DP - ROBOTICS**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

UNIT I: INTRODUCTION

9

Robot ,its evaluation; definition and aes of robotics, present application status.

UNIT II: ROBOT ANATOMY

9

configuration, robot motions, work volume. Robot drives, actuators and control; Functions and types of drives and actuators; concept of basic control systems, open loop, close loop, different type of controllers, ON-OFF, proportional, integral, PI, PD, PID.

UNIT III: ROBOT END EFFECTORS:

9

Types of end effecters, mechanical gripper, tools and end effectors. Robot sensors: Transducers and sensors; analog and digital transducers; types of sensors, tachfile sensors, proximity and rough sensors ; miscellaneous sensors; vision systems; use of sensors in robotics.

UIT IV: ROBOT KINEMATICS

9

Position representations; forward and reverse kinematics of three and four degrees of freedom; robot arm; homogeneous transformations and robot kinematics; kinematics equations using homogeneous transformation .

UNIT V: INDUSTRIAL APPLICATION

9

Capabilities of robots; robot applications; materials handling; pick and place operation; palletiging and depalletiging; machine loading and unloading; machine casting; welding;painting,assembly; inspection; maintenance.

BOOKS RECOMMENDED:

- 1.Schilling-Fundamental of robotics; PH
- 2.Yoshikawa- Fundamental of robotics; PH
3. S.R.Deb-Robotics Technology and Flexible Automation
4. Introduction to Robotics, John J Craig; Pearson Education

ELECTIVE III
Semester VI

17160E64AP - PRINCIPLES OF MANAGEMENT 4 0 0 4**OBJECTIVE**

- i. To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- ii. To understand the statistical approach for quality control.
- iii. To create an awareness about the ISO and QS certification process and its need for the industries

UNIT I HISTORICAL DEVELOPMENT

12

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 12

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 12

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 12

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques –Job Enrichment – Communication – Process of Communication – Barriers and Breakdown –Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 12

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL = 60

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCE BOOKS

1. Tripathy PC And Reddy PN, “ Principles of Management”, Tata Mcgraw Hill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “ Engineering Management”, Addison Wesley,-2000.

17160E64BP - PROFESSIONAL ETHICS

4 0 0 4

AIM :

To ensure that the required technical knowledge and skills can be learnt .

OBJECTIVES :

- i. To create an awareness on Engineering Ethics and Human Values.
- ii. To instill Moral and Social Values and Loyalty
- iii. To appreciate the rights of Others

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

Total = 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “ Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “ Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “ Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “ Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001 .

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ELECTIVES-III
SEMESTER-VI

17152E64CP INTEGRATED OPTO-ELECTRONIC DEVICES 3 1 0 4

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVE

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To understand different light modulation techniques and the concepts and applications of optical switching.

UNIT I: ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III: OPTICAL DETECTION DEVICES 9

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated circuits, integrated transmitters and Receivers, Guided wave devices.

TEXTBOOK

1. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall of India Pvt. Ltd., NewDelhi, 1995.

REFERENCES

1. Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., NewDelhi, 1995.
2. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998.

ELECTIVES-III
SEMESTER-VI

17153E64DP -COMPUTER AIDED DESIGN FOR ELECTRICAL APPARATUS

3 1 0 4

AIM

To introduce the basics of Computer Aided Design technology for the design of Electrical Machines.

OBJECTIVE

At the end of this course the student will be able to

- Learn the importance of computer aided design method.
- Understand the basic electromagnetic field equations and the problem formulation for CAD applications.
- Become familiar with Finite Element Method as applicable for Electrical Engineering.
- Know the organization of a typical CAD package.
- Apply Finite Element Method for the design of different Electrical apparatus.

UNIT I: INTRODUCTION 12

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II: MATHEMATICAL FORMULATION OF FIELD PROBLEMS 12

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNIT III: PHILOSOPHY OF FEM 12

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variation method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques.

UNIT IV: CAD PACKAGES

12

Elements of a CAD System –Pre-processing – Modeling – Meshing – Material properties- Boundary Conditions – Setting up solution – Post processing.

UNIT V: DESIGN APPLICATIONS

12

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

TEXT BOOKS

1. S.J Salon, 'Finite Element Analysis of Electrical Machines', Kluwer Academic Publishers, London, 1995.
2. Nicola Bianchi, 'Electrical Machine Analysis using Finite Elements', CRC Taylor& Francis, 2005.

REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, 'Electromagnetic Modeling by Finite Element Methods', Marcell Dekker Inc., 2003.
2. P.P.Silvester and Ferrari, 'Finite Elements for Electrical Engineers', Cambridge University Press, 1983.
3. D.A.Lowther and P.P Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, New York, 1986.
4. S.R.H.Hoole, 'Computer Aided Analysis and Design of Electromagnetic Devices', Elsevier, New York, 1989.
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.

ELECTIVES-IV
SEMESTER-VII

17153E74AP- POWER SYSTEM TRANSIENTS

3 0 0 3
Semester VII

AIM

To understand generation of switching and lightning transients, their propagation, reflection and refraction on the grid and their impact on the grid equipment.

OBJECTIVES

- i. To study the generation of switching transients and their control using circuit – theoretical concept.
- ii. To study the mechanism of lightning strokes and the production of lightning surges.
- iii. To study the propagation, reflection and refraction of travelling waves.
- iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 7

Various types of power system transients - effects of transients on power systems.

UNIT II LIGHTNING AND SWITCHING SURGES 17

Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNIT III MODELLING OF POWER SYSTEM EQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNIT IV COMPUTATION OF TRANSIENT OVERVOLTAGES 14

Computation of transients – traveling wave method, Bewley's lattice diagram – analysis in time and frequency domain, EMTP for transient computation.

UNIT V INSULATION COORDINATION 12

Insulation co-ordination – over voltage protective devices principles of recent co-ordination and design of EHV lines. **Total = 60**

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter science, New York, 2nd edition 1991.
2. R.D Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCES

1. Klaus Ragaller, 'Surges in High Voltage Networks', Plenum Press, New York, 1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

ELECTIVES-IV
SEMESTER-VII

17153E74BP -EHV AC and DC TRANSMISSION SYSTEMS

3 0 0 3

UNIT I TRANSMISSION ENGINEERING 9

Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.

UNIT II LINE PARAMETER 9

Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.

UNIT III POWER CONTROL 9

Power frequency and voltage control – voltage control – Over voltages – Power circle diagram – Voltage control using shunt and series compensation – Static VAR compensation – Higher Phase order system – FACTs.

UNIT IV EHV AC Transmission 9

Design of EHV lines based in steady state limits and transient over voltages – Design of extra HV cable transmission – XLPE cables – Gas insulated cable – Corona and RIV.

UNIT V HVDC TRANSMISSION 9

HVDC Transmission principles – Comparison of HVAC and HVDC transmission – Economics – types of Converters – HVDC links – HVDC control – Harmonics – Filters – Multi terminal DC System – HVDC cables and HVDC circuit breakers.

Total=45

Reference Books:

1. Rakosh Das Begamudre, 'Extra HVDC Transmission Engineering', Wiley Eastern Ltd, 1990.
2. Padiyar K.R., 'HVDC Power Transmission systems', Wiley Eastern Ltd, 1993.
3. Allan Greenwood, 'Electrical transients in power Systems', John Eastern Ltd, New York, 1992.
4. Arrilaga J., 'HVDC transmission', Peter Perengrinus Ltd, London, 1983.

**ELECTIVES-IV
SEMESTER-VII**

17153E74CP-FIBRE OPTICS AND LASER INSTRUMENTS 3 0 0 3

AIM:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial & Medical Application.

OBJECTIVES

- To expose the students to the basic concepts of optical fibres and their properties.
- To provide adequate knowledge about the Industrial applications of optical fibres.
- To expose the students to the Laser fundamentals.
- To provide adequate knowledge about Industrial application of lasers.
- To provide adequate knowledge about holography & Medical applications of Lasers.

1. OPTICAL FIBRES AND THEIR PROPERTIES 12

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors & splicers – Fibre termination – Optical sources – Optical detectors.

2. INDUSTRIAL APPLICATION OF OPTICAL FIBRES

9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

3. LASER FUNDAMENTALS

9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

4. INDUSTRIAL APPLICATION OF LASERS

6

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

5. HOLOGRAM AND MEDICAL APPLICATIONS

9

Holography – Basic principle - Methods – Helographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumours of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

L= 45 Total = 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Donald J. Sterling Jr, 'Technicians Guide to Fibre Optics', 3rd Edition, Vikas Publishing House, 2000.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968
5. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
6. Mr. Gupta, 'Fiber Optics Communication', Prentice Hall of India, 2004.

17153E74DP- ADVANCED CONTROL SYSTEMS

3 0 0 3

AIM

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

To gain knowledge in analysis of non-linear system and digital control of linear system.

OBJECTIVES

- i. To study the description and stability of non-linear system.
- ii. To study the conventional technique of non-linear system analysis.
- iii. To study the analysis discrete time systems using conventional techniques.
- iv. To study the analysis of digital control system using state-space formulation.
- v. To study the formulation and analysis of multi input multi output (MIMO) system.

UNIT I NON-LINEAR SYSTEM – DESCRIPTION & STABILITY

9

Linear vs non-linear – Examples – Incidental and Intentional – Mathematical description - Equilibria and linearisation - Stability – Lyapunov function – Construction of Lyapunov function.

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS

9

Construction of phase trajectory – Isocline method – Direct or numerical integration – Describing function definition – Computation of amplitude and frequency of oscillation.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM

9

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT IV STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM

9

State equation – Solutions – Realization – Controllability – Observability – Stability Jury's test.

UNIT V MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:

9

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control. **L = 45 Total = 45**

TEXT BOOKS

1. Benjamin C. Kuo, 'Digital Control Systems', Oxford University Press, 1992.
2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

REFERENCE BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Raymond T. Stefani & Co., 'Design of feed back Control systems', Oxford University, 2002.
3. William L. Luyben and Michael L. Luyben, 'Essentials of Process Control', McGraw Hill International Editions, Chemical Engineering Series, 1997.



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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS
ENGINEERING

PROGRAM HANDBOOK

B.TECH PART TIME

[REGULATION 2019]

[for candidates admitted to B.Tech EEE program from June 2019 onwards]

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

COURSE STRUCTURE

B.TECH PT
EEE
R 2019

2

B. Tech (PT) EEE R 19**SEMESTER I**

Sl. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19148S11P	Transforms and Partial Differential Equations	3	1	0	4
2	19153C12P	Control System	3	1	0	4
3	19153C13P	Circuit Analysis and Networks	3	1	0	4
4	19153C14P	Electronic circuits	3	0	0	3
5	19153C15P	Electrical Machines-I	4	0	0	4
Total No of						19

SEMESTER II

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19148S21P	Numerical Methods	3	1	0	4
2	19153C22P	Computer Architecture	3	0	0	3
3	19153C23P	Electrical Machines-II	3	1	0	4
4	19153C24P	Digital Electronics	3	1	0	4
5	19153C25P	Transmission and Distribution	4	0	0	4
Total No of Credits						19

SEMESTER III

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19148S31CP	Probability and Statistics	3	1	0	4
2	19153C32P	Analog Integrated Circuits	3	1	0	4
3	19153C33P	Power Electronics	4	0	0	4
4	19153C34P	Measurements and Instrumentation	4	0	0	4
5	19153L35P	Machines Lab	0	0	3	2
Total No of Credits						18

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

SEMESTER IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153C41P	Protection and switchgear	4	0	0	4
2	19153C42P	High Voltage DC Transmission	3	1	0	4
3	19153C43P	Solid State Drives	3	1	0	4
4	19153E44_P	Elective –I	4	0	0	4
5	19153L45P	Control System & Measurements Lab	0	0	3	2
Total No of Credits						18

SEMESTER V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153C51P	Power System Analysis	3	1	0	4
2	19153C52P	Power Quality	3	1	0	4
3	19153C53P	Special Electrical Machines	4	0	0	4
4	19153E54_P	Elective –II	4	0	0	4
5	19153L55P	Power Electronics and Drives Lab	0	0	3	2
Total No of Credits						18

SEMESTER VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153C61P	Utilization of Electrical Energy	3	1	0	4
2	19153C62P	Solid State Relays	4	0	0	4
3	19153C63P	Power System Operation and Control	4	0	0	4
4	19153E64_P	Elective –III	4	0	0	4
5	19153L65P	Power Systems Lab	0	0	3	2
Total No of Credits						18

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19160S71P	Total Quality Management	3	0	0	3
2	19153C72P	Electrical Machine Design	3	1	0	4
3	19153C73P	Power Plant Engineering	4	0	0	4
4	19153E74_P	Elective –IV	3	0	0	3
5	19153P75P	Project Work	0	0	12	6
Total No of Credits						20

LIST OF ELECTIVES

ELECTIVE –I (IV SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153E44AP	Field Theory	4	0	0	4
2	19153E44BP	Fuzzy Logic and its applications	4	0	0	4
3	19153E44CP	Bio Medical Instrumentation	4	0	0	4
4	19153E44DP	Modeling and Simulation of Solar Energy Systems	4	0	0	4
5	19153E44EP	Non conventional energy system & Applications	4	0	0	4

ELECTIVE –II (V SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153E54AP	Environmental Science and Engineering	4	0	0	4
2	19153E54BP	Artificial Neural Networks	4	0	0	4
3	19153E54CP	Communication Engineering	4	0	0	4
4	19153E54DP	Robotics	4	0	0	4
5	19153E54EP	LT & HT Distribution System	4	0	0	4

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

ELECTIVE –III (VI SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153E64AP	Principles of Management	4	0	0	4
2	19153E64BP	Professional Ethics	4	0	0	4
3	19153E64CP	Integrated opto-Electronic Devices	4	0	0	4
4	19153E64DP	Computer Aided Design of Electrical Apparatus	4	0	0	4
5	19153E64EP	Advanced DC-AC Power conversion	4	0	0	4

ELECTIVE –IV (VII SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19153E74AP	Power system transients	3	0	0	3
2	19153E74BP	EHV AC and DC Transmission systems	3	0	0	3
3	19153E74CP	Fiber Optics and Laser Instruments	3	0	0	3
4	19153E74DP	Advanced Control systems	3	0	0	3
5	19153E74EP	Switched Mode Power supplies	3	0	0	3

19148S11P-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

3 1 0 4

(Common to all)

SEMESTER-1

UNIT I FOURIER SERIES

9 + 3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM

9 + 3hrs

Fourier integral theorem (without proof) – Sine and Cosine transforms – Properties (without Proof) – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier transform, Sine and Cosine transform.

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS

9 + 3hrs

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z – transform- Sampling of signals –an introduction.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS

9 + 3hrs

Formation of pde –solution of standard type first order equation- Lagrange's linear equation – Linear partial differential equations of second order and higher order with Constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS

9 + 3hrs

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

Total no of hrs: 60hrs

COURSE OUTCOMES

Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS

1. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillen , New York ,1988.
2. Grewal, B.S., “Higher Engineering Mathematics”, Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., “Engineering Mathematics Volume III”, S. Chand & Company ltd., New Delhi, 1996.

REFERENCE BOOKS

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramanaiah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
3. Advanced Modern Engineering mathematics – Glyn James

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

- i. To understand the methods of representation of systems and getting their transfer function models.
- ii. To provide adequate knowledge in the time response of systems and steady state error analysis.
- iii. To give basic knowledge is obtaining the open loop and closed-loop frequency responses of systems.
- iv. To understand the concept of stability of control system and methods of stability analysis.
- v. To study the three ways of designing compensation for a control system.

UNIT I: INTRODUCTION**12**

Open-loop and closed –loop systems, servomechanisms and regulator systems; Transfer function; Block diagram reduction, Signal flow graphs.

UNIT II: MATHEMATICAL MODELS OF PHYSICAL SYSTEMS**12**

Mechanical systems - Translational and Rotational systems, Gear trains, Electrical systems, Thermal systems and Fluid systems.

Components of feedback control systems - Potentiometers as error sensing devices, Synch, Servomotors, Stepper motors, Tachogenerators.

UNIT III: STABILITY**12**

Concept of Stability, necessary and sufficient conditions of Stability, Closed-loop systems, merits and demerits, Routh-Hurwitz Criterion.

Transient Response: Typical inputs, convolution integral, Time domain specifications, steady state errors.

State equation – Solutions – Realization – Controllability – Observability – Stability
Jury's test.

UNIT IV: FREQUENCY RESPONSE**12**

Definition, equivalence between transient response and frequency response, Bode plots.

Nyquist Stability Criterion: Development of criterion, gain and phase margins, m- circles and Nichol's chart.

UNIT V: ROOT LOCUS METHOD**12**

Rules for sketching of root loci, Root contours.

Synthesis: Lag and Lead networks, proportional, derivative and integral controllers.

MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

Total = 60

COURSE OUTCOMES

At the end of the course, the student should have the :

Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.

Ability to do time domain and frequency domain analysis of various models of linear system.

Ability to interpret characteristics of the system to develop mathematical model.

Ability to design appropriate compensator for the given specifications.

Ability to come out with solution for complex control problem.

Ability to understand use of PID controller in closed loop system.

TEXT BOOK:

1. I.J.Nagrath and M.Gopal, 'Control System Engineering', Wiley Eastern Ltd., Reprint 1995.

REFERENCES:

1. M.Gopal, 'Control System Principles and Design', Tata McGraw Hill, 1998.
2. Ogatta, 'Modern Control Engineering', Tata McGraw Hill 1997.

19153C13P- CIRCUIT ANALYSIS AND NETWORKS

3 1 0 4

AIM

SEMESTER-1

To know about basic analysis and synthesis techniques used in electronics and communications.

OBJECTIVES

- To study about various network theorems and the method of application to analyse a circuit.
- To know the concept of transfer function of a network and the nature of response to external inputs.
- To synthesize a network in different forms from the transfer function.
- To know the concept and design of frequency selective filters.

UNIT-I BASIC CIRCUIT CONCEPTS & SINUSOIDAL ANALYSIS (12hrs)

Linear passive circuit elements, ideal sources (independent and dependent), V-I relationship of circuit elements – Ohm's Law - Kirchoff's Laws – analysis of series and parallel circuits – network reduction: voltage and current division, source transformation, star/delta transformation Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (volt -ampere), power factor– phasor diagram, impedance triangle and power triangle associated with these circuits – resonance in series and parallel circuits

UNIT-II CIRCUIT ANALYSIS & NETWORK THEOREMS (12hrs)

Formation of matrix equations and analysis by using Mesh-current and Node-voltage methods. Superposition theorem – Thevenin's theorem – Norton's theorem - Maximum power transfer theorem - Reciprocity theorem – Compensation theorem – Substitution theorem - Millman's theorem and Tillage's theorem with applications.

Coupled circuits: self inductance - mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits. Equivalent inductance of the series aiding and opposing, parallel aiding and opposing coupled circuits.

UNIT-III THREE PHASE CIRCUIT AND TRANSIENT ANALYSIS (12hrs)

Three-phase systems – phase sequence - Solution of three-phase balanced circuits (Star & Delta) – Solution of three-phase unbalanced circuits (Star & Delta) - Power measurement and two-wattmeter method.

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

UNIT-IV TWO PORT NETWORKS (12hrs)

Characterization of two port networks in terms of Z, Y, H and T parameters – networks equivalents – relations between network parameters – Analysis of T, Ladder, Bridged-T and lattice networks – transfer function of terminated two port networks.

UNIT-V NETWORK TOPOLOGY, FILTERS & ATTENUATORS (12hrs)

Network graphs, tree and cut – sets – tie set and cut – set schedules – primitive impedance and admittance matrices- Classification of Filters - filter networks - design of constant K, m-derived and composite filters. Analysis of T, lattice, bridged-T, and L type attenuators.

TOTAL 60

COURSE OUTCOMES

Ability to analyse electrical circuits

Ability to apply circuit theorems

Ability to analyse transients

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering – Muthu subramaniyam
2. Nageswara rao
3. Umesh sinha
4. Charavarthi
1. Sudhakar. A., and Shyammohan, “Circuits and Networks Analysis and Synthesis” Tata McGraw Hill Publishing Co.Ltd. New Delhi, 1994.
2. Roy Choudhury, “Networks and Systems”, New Age International Ltd.

19153C14P - ELECTRONIC CIRCUITS

3 0 0 3
SEMESTER-1

AIM:

To study the characteristics and applications of electronic devices.

OBJECTIVES:

To acquaint the students with construction, theory and characteristics of the following electronic devices:

Bipolar transistor, Field Effect transistor, Multivibrators, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I -RECTIFIER & POWER SUPPLY 12

Half & Full wave rectifier – filters – shunt , inductor, LC section & Ripple factor, P calculation for C, L and LC filters – Voltage regulators – Zener –Series voltage regulator – SMPS.

UNIT II- AMPLIFIERS 12

Amplifiers – Frequency response of RC coupled - Frequency Response of Emitter follower, gain band width product – FET amplifier at low and high frequency cascaded amplifiers.

UNIT III- FEEDBACK AMPLIFIER & OSCILLATORS 12

Four basic types of feedback – effect of feedback on amplifier performance – condition for oscillation – Barkhausen criteria – LC oscillators – Hartley & Colpitts – RC oscillators – Wein bridge, RC phase shift crystal oscillator.

UNIT IV- MULTIVIBRATORS 12

Collector coupled & Emitter coupled Astable multivibrator – Monostable, Bistable multivibrator – triggering methods – Storage delay and calculation of switching time – Schmitt triggering circuits – Speed up capacitor in switching.

UNIT V- POWER AMPLIFIER 12

Classification – class A, B, C & AB – Class B push pull – Class B Complimentary – symmetry – Class S, Power sections classification – Efficiency – Distortion in amplifiers.

L = 45 T = 15 P = 0 TOTAL =60

COURSE OUTCOMES

Upon Completion of the course, the students will be able to:

Explain the structure and working operation of basic electronic devices.

Able to identify and differentiate both active and passive elements

Analyze the characteristics of different electronic devices such as diodes and transistors

Choose and adapt the required components to construct an amplifier circuit.

Employ the acquired knowledge in design and analysis of oscillators

REFERENCE BOOKS:

1. David.A.Bell, “Solid State Pulse Circuits”, Prentice Hall of India, 4th Edition, 2001.
2. Millman Taub.H, “Pulse Digital & Switching waveform”, Tata McGraw Hill International 2001.
3. Jacob Millman Cristas C.Halkias, “Integrated Electronics”, Tata McGraw Hill, Edition 1991.

19153C15P- ELECTRICAL MACHINES – I

4 0 0 4

AIM

SEMESTER-1

To expose the students to the concepts of electromechanical energy conversions in D.C. Machines and energy transfer in transformers and to analyze their performance.

OBJECTIVES

- i. To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.
- ii. To understand the generation of D.C. voltages by using different type of generators and study their performance.
- iii. To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.
- iv. To familiarize with the constructional details of different type of transformers, working principle and their performance.
- v. To estimate the various losses taking place in D.C. machines and transformers and to study the different testing method to arrive at their performance.

UNIT I: BASIC PRINCIPLES OF ROTATING MACHINES

12

Electrical machine types – Magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits - core losses. Principles of Electromechanical energy conversion: Energy conversion process – Energy in magnetic system – Field energy and mechanical force – Multiply excited magnetic field systems

UNIT II: GENERATORS

12

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNIT III: DC MOTORS

12

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

UNIT IV: TRANSFORMERS

12

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio - Equivalent circuit – Losses – Testing – Efficiency and Voltage regulation .

Transformer on load– Parallel operation of single phase transformers – Auto transformer – Three phase transformers

UNIT V: TESTING OF TRANSFORMERS AND DC MACHINES

12

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

TOTAL = 60

COURSE OUTCOMES

Ability to analyze the magnetic-circuits.

Ability to acquire the knowledge in constructional details of transformers. Ability to understand the concepts of electromechanical energy conversion. Ability to acquire the knowledge in working principles of DC Generator.

Ability to acquire the knowledge in working principles of DC Motor

Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J .B.Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.
4. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and Company Ltd, third edition, 2003.

19148S21P-NUMERICAL METHODS

3 1 0 4
Semester II

UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3hrs

Solution of equations–Newton Raphson’s method, Regula-falsi methods Solution of linear System of equations by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods– Eigenvalue of a matrix by power method.

UNIT II- INTERPOLATION

9+3hrs

Newton’s forward and backward difference formulas – Central difference formula: Bessels and Stirling’s formula - Lagrangian Polynomials – Divided difference method.

UNIT III- NUMERICAL DIFFERENTIATION AND INTEGRATION

9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Double integrals using trapezoidal and Simpson’s rules.

UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9+3hrs

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne’s and Adam’s predictor and corrector methods.

UNIT V - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

9+3hrs

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total no of hrs: 60hrs

COURSE OUTCOMES

- Understand the basic concepts and techniques of solving algebraic equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.

Apply the numerical techniques of differentiation and integration for engineering problems.

Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, “Applied Numerical Analysis”, Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., “Numerical Methods”, S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES BOOKS

1. Burden, R.L and Faires, T.D., “Numerical Analysis”, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., “Numerical Methods”, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

19153C22P - COMPUTER ARCHITECTURE

3 0 0 3
SEMESTER II

AIM:

To understand the architecture of different processor and its associative units

OBJECTIVES:

To provide a clear understanding of

- Computer arithmetic and logic unit design.
- Control Mechanism and CPU functioning.
- Pipeline architecture and vector processing.
- Input and output organizations and interfacing.
- Various memories and their organization.56

UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – hardware – software interface – addressing modes – instruction set – RISC – CISC – ALU design – fixed point and floating point operation.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT 9

Micro programmed control – Control memory, address sequencing, micro program example, and design of control unit. Central processing unit – general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9

Computer arithmetic – addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations decimal arithmetic unit, decimal arithmetic operations. Pipeline and vector processing – Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing array processors.

UNIT IV INPUT OUTPUT ORGANIZATION 9

Input output organization : peripheral devices, input output interface, asynchronous data transfer , modes of transfer, priority interrupt, direct memory access, input output interface, serial communication.

UNIT V MEMORY ORGANIZATION 9

Memory organization – memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Develop Java programs using OOP principles

Develop Java programs with the concepts inheritance and interfaces

Build Java applications using exceptions and I/O streams

Develop Java applications with threads and generics classes
Develop interactive Java programs using swings

TEXT BOOKS:

1. Morris Mano, 'Computer system architecture', 3rd edition, Pearson education 2002
2. Behrooz Parhami, 'Computer Architecture', Oxford University Press, 2005.

REFERENCES:

1. Vincent P. Heuring and Harry F. Jordan, ' Computer systems design and architecture', Pearson Education Asia Publications, 2004.
2. John P. Hayes , ' Computer Architecture and Organization', Tata McGraw-Hill, 1988.
3. Andrew S Tannenbaum ' Structured Computer Organization ', 5th edition Pearson Education 2007.
4. William Stallings , ' Computer Organization and architecture', 7th edition Pearson Education 2006.

19153C23P-ELECTRICAL MACHINES-II**3 1 0 4****AIM:**

To expose the students to the concepts of synchronous and asynchronous machines and analyze their performance.

OBJECTIVES:

To impart knowledge on

- i. Construction and performance of salient and non – salient type synchronous generators.
- ii. Principle of operation and performance of synchronous motor.
- iii. Construction, principle of operation and performance of induction machines.
- iv. Starting and speed control of three-phase induction motors.
- v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I: SYNCHRONOUS GENERATOR**12**

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

UNIT II: SYNCHRONOUS MOTOR**12**

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

UNIT III: THREE PHASE INDUCTION MOTOR**12**

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors

UNIT IV: STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**12**

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

UNIT V: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINE**12**

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test — Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor

Total = 60

COURSE OUTCOMES

Ability to understand the construction and working principle of Synchronous Generator

Ability to understand MMF curves and armature windings.

Ability to acquire knowledge on Synchronous motor.

Ability to understand the construction and working principle of Three phase Induction Motor

Ability to understand the construction and working principle of Special Machines

Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.*REFERENCE BOOKS*

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.

19153C24P-DIGITAL ELECTRONICS**3 1 0 4****AIM:**

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES:

- i. To study various number systems and to simplify the mathematical expressions using Boolean functions simple problems.
- ii. To study implementation of combinational circuits
- iii. To study the design of various synchronous and asynchronous circuits.
- iv. To expose the students to various memory devices.

UNIT I NUMBER SYSTEMS**12**

Review of Binary, Octal and Hexa-decimal number systems – Conversions, Binary Arithmetic magnitude form – 1's, 2's complement representation, Codes: -BCD, Excess – 3, Graycode, ASCII codes, Error detecting codes (Hamming code)

UNIT II BOOLEAN ALGEBRA**12**

Boolean Algebra - De Morgan's law – Simplifications of Boolean expression – sum of Products and product of sums – Karnaugh Map – Quince McClusky method of simplification (Including Don't care conditions)

UNIT III Combinational Logic**12**

Design of Logic gates- Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT IV Sequential Logic Design**12**

Building blocks of Sequential logic – RS, JK, Master – Slave, D and T flip- flop, Asynchronous and synchronous counters – Binary and BCD counters – shift registers – Design and Implementation of Sequential synchronous circuits

UNIT V Logic Families

12

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TOTAL = 60Hrs

COURSE OUTCOMES

Ability to design combinational and sequential Circuits.

Ability to simulate using software package.

Ability to study various number systems and simplify the logical expressions using

Boolean functions

Ability to design various synchronous and asynchronous circuits.

Ability to introduce asynchronous sequential circuits and PLDs

Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOK:

1. Albert Paul, Malvino and Donald.P.Leach , “Digital Principles and Applications”, McGraw Hill Publications.
2. Floyd, “Digital Fundamentals”, Universal Book Stall, New Delhi,1993.
3. Moris Mano, “Digital Electronics and Design “, Prentice Hall of India, 2000.

REFERENCE:

1. “Digital Logic & Computer Design”, Prentice Hall of India, 2000.

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

- i. To develop expression for computation of fundamental parameters of lines.
- ii. To categorize the lines into different classes and develop equivalent circuits for these classes.
- iii. To analyze the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I: INTRODUCTION**12**

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability.

Radial and ring-main distributors; interconnections; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

UNITII:TRANSMISSION LINE PARAMETERS**12**

Resistance, Inductance and Capacitance of single and three phase transmission lines - Stranded and Bundled conductors -Symmetrical and unsymmetrical spacing - Transposition -Application of self and mutual GMD -Skin and Proximity effect - Inductive interference with neighboring circuits.

UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES**12**

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV: INSULATORS AND CABLES**12**

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V: DESIGN OF TRANSMISSION LINES**12**

Introduction, calculation of sag and tension .Equivalent span length and sag, Effect of ice and wind loading ,Stringing chart, sag template, conductor vibrations and vibrations dampers

TOTAL =60

COURSE OUTCOMES

To understand the importance and the functioning of transmission line parameters.

To understand the concepts of Lines and Insulators.

To acquire knowledge on the performance of Transmission lines.

To acquire knowledge on Underground Cabilitys

TEXT BOOKS

1. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2003.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCE BOOKS

1. Luces M.Fualkenberry ,Walter Coffe, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

19148S31CP -PROBABILITY AND STATISTICS

3 1 0 4

(Common to Mech, Civil, EEE)

SEMESTER-III

UNIT I PROBABILITY AND RANDOM VARIABLE

9+3hrs

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties - Moments - Moment generating functions and their properties.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES

9+3hrs

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

UNIT III STANDARD DISTRIBUTIONS

9+3hrs

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

UNIT IV TESTING OF HYPOTHESIS

9+3hrs

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS

9+3hrs

Analysis of variance – One way classification – Complete randomized design - Two – way classification – Randomized block design - Latin square.

Note : Use of approved statistical table permitted in

Total no of hrs: 60hrs

COURSE OUTCOMES

Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.

Gradient, divergence and curl of a vector point function and related identities.

Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.

Analytic functions, conformal mapping and complex integration.

Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients

TEXT BOOKS

1. Ross. S., “A first Course in Probability”, Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES BOOKS

- 1) Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K., “Probability and Statistics for Engineers and Scientists”, Seventh Edition, Pearsons Education, Delhi, 2002.
- 2) Lipschutz. S and Schiller. J, “Schaum’s outlines - Introduction to Probability and Statistics”, McGraw-Hill, New Delhi, 1998.
- 3) Gupta, S.C, and Kapur, J.N., “Fundamentals of Mathematical Statistics”, Sultan Chand, Ninth Edition , New Delhi ,1996.

19153C32P- ANALOG INTEGRATED CIRCUITS 3 1 0 4

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of Ics.

OBJECTIVES

- i. To study the IC fabrication procedure.
- ii. To study characteristics; realize circuits; design for signal analysis using Op-amp Ics.
- iii. To study the applications of Op-amp.
- iv. To study internal functional blocks and the applications of special Ics like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I: IC FABRICATION

9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic Ics and packaging.

UNIT II: CHARACTERISTICS OF OPAMP

9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer and subtractor – Multiplier and divider- differentiator and integrator.

UNIT III: APPLICATIONS OF OPAMP

9

Instrumentation amplifier, V/I & I/V converters, comparators, multivibrators, waveform generators, Precision rectifier, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter – Dual slope, successive approximation and flash types.

UNIT IV: ACTIVE FILTERS AND SPECIAL ICs

9

RC Active filters : low pass – high pass – band pass – band reject – switched capacitor filter – 555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier Ics.

UNIT V: APPLICATION ICs

9

IC voltage regulators – LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic Ics.

TOTAL = 45

COURSE OUTCOMES

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.

Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.

To understand and acquire knowledge on the Applications of Op-amp

Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI.
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.

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19153C33P - POWER ELECTRONICS**4 0 0 4****AIM:**

To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

OBJECTIVES:

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.

UNIT I- POWER SEMI-CONDUCTOR DEVICES :**12**

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

UNIT II-PHASE CONTROLLED CONVERTERS**12**

2 pulse / 3 pulse and 6 pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters.

UNIT III -DC TO DC CONVERTERS**12**

Stepdown and stepup chopper – Forced commutation techniques – Time ratio control and current limit control – Switching mode regulators Buck, Boost, Buck-Boost – concept of resonant switching.

UNIT IV- INVERTERS**12**

Single phase and three phase [120° & 180° mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM – Voltage and harmonic control – Series resonant inverter – current source inverter.

UNIT V- AC TO AC CONVERTERS**12**

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverters – power factor control – Matrix converters.

L: 45 T: 15 TOTAL: 60 PERIODS**COURSE OUTCOMES**

| Ability to analyse AC-AC and DC-DC and DC-AC converters.

Ability to choose the converters for real time applications.

TEXT BOOKS:

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

19153C34P-MEASUREMENTS AND INSTRUMENTATION

4004

Semester III

AIM

To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.

- i. Introduction to general instrument system, error, calibration etc.
- ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- iii. To have an adequate knowledge of comparison methods of measurement.
- iv. Elaborate discussion about storage & display devices.
- v. Exposure to various transducers and data acquisition system.

UNIT I: INTRODUCTION 10

Functional elements of an Instrument -Static and Dynamic characteristics -Errors in measurement -Statistical evaluation of measurement data -Standard and Calibration.

UNIT II: ELECTRICAL AND ELECTRONICS INSTRUMENTS 12

Construction and principle of operation of moving coil, moving Iron, Principle and types analog and digital ammeters and voltmeters -Single and three phase Wattmeter and Energy meter - magnetic measurements - -Instruments for measurement of frequency and phase.

UNIT III: SIGNAL CONDITIONING CIRCUITS 12

Bridge circuits – Differential and Instrumentation amplifiers -Filter circuits - V/f and f/V converters – P/I and I/P converters – S/H Circuit, A/D and D/A converters -Multiplexing and De-multiplexing -Data acquisition systems –Grounding techniques.

UNIT IV: STORAGE AND DISPLAY DEVICES 12

Magnetic disc and Tape Recorders -Digital plotters and printers -CRT displays -Digital CRO – LED, LCD and Dot matrix displays.

UNIT V: TRANSDUCERS 14

Classification of Transducers -Selection of Transducers –Resistive, Capacitive and Inductive Transducers -Piezo electric Transducers -Transducers for measurement of displacement, temperature, level, flows, pressure, velocity, acceleration, torque, speed, viscosity and moisture.

Total = 60

COURSE OUTCOMES

To acquire knowledge on Basic functional elements of instrumentation

To understand the concepts of Fundamentals of electrical and electronic instruments

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

Ability to compare between various measurement techniques

To acquire knowledge on Various storage and display devices

To understand the concepts Various transducers and the data acquisition systems

Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

TEXT BOOKS

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2003.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 1995.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.

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19153L35P- MACHINES LAB

0 0 3 2

Semester III

LIST OF EXPERIMENTS

1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

TOTAL: 45

COURSE OUTCOMES

At the end of the course, the student should have the :

Ability to understand and analyze EMF and MMF methods

Ability to analyze the characteristics of V and Inverted V curves

Ability to understand the importance of Synchronous machines

Ability to understand the importance of Induction Machines

Ability to acquire knowledge on separation of losses

19153C41P- PROTECTION AND SWITCHGEAR**4 0 0 4****AIM**

To expose the students to the various faults in power system and learn the various methods of protection scheme.

To understand the current interruption in Power System and study the various switchgears.

OBJECTIVES

- i. Discussion on various earthing practices usage of symmetrical components to estimate fault current and fault MVA.
- ii. Study of Relays & Study of protection scheme, solid state relays.
- iii. To understand instrument transformer and accuracy.
- iv. To understand the method of circuit breaking various arc theories Arcing phenomena – capacitive and inductive breaking.
- v. Types of circuit breakers.

UNIT I: INTRODUCTION**12**

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNIT II: OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS**12**

Need for protection – essential qualities of protective relays – Electromagnetic relays, Induction relays – Over current relays - Directional, Distance, Differential and negative sequence relays. Static relays

UNIT III: APPARATUS PROTECTION**12**

Apparatus protection transformer, generator, motor, protection of bus bars, transmission lines – CTs and PTs and their applications in protection schemes.

UNIT IV: THEORY OF CIRCUIT INTERRUPTION**12**

Physics of arc phenomena and arc interruption. Restricting voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNIT V: CIRCUIT BREAKERS**12**

Types of Circuit Breakers – Air blast, Air break, oil SF₆ and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers

COURSE OUTCOMES

- Ability to understand and analyze Electromagnetic and Static Relays.
- Ability to suggest suitability circuit breaker.
- Ability to find the causes of abnormal operating conditions of the apparatus and system.
- Ability to analyze the characteristics and functions of relays and protection schemes. Ability to study about the apparatus protection, static and numerical relays.
- Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

REFERENCE BOOKS

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2001.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

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19153C42P -HIGH VOLTAGE DC TRANSMISSION

3 1 0 4

Semester IV

AIM:

To learn the HVDC modelling and control strategy.

OBJECTIVES:

- To study the performance of converters and modeling of DC line with controllers.
- To study about converter harmonics and its mitigation using active and passive filters.

UNIT I- DC POWER TRANSMISSION TECHNOLOGY

9

Introduction-comparison of AC and DC transmission application of DC transmission – Description of DC transmission system planning for HVDC transmission-modern trends In DC transmission.

UNIT II- ANALYSIS OF HVDC CONVERTERS

9

Pulse number, choice of converter configuration-simplified analysis of Graetz circuit converter bridge characteristics – characteristics of a twelve pulse converter-detailed analysis of converters.

UNIT III- CONVERTER AND HVDC SYSTEM CONTROL

9

General principles of DC link control-converter control characteristics-system control Hierarchy-firing angle control-current and extinction angle control-starting and stopping of DC link-power control-higher level controllers-telecommunication requirements.

UNIT IV -HARMONICS AND FILTERS

9

Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency and RI noise.

UNIT V -SIMULATION OF HVDC SYSTEMS

9

Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Ability to understand Generation and measurement of high voltage.

Ability to understand High voltage testing.

Ability to understand various types of over voltages in power system. Ability to measure over voltages.

Ability to test power apparatus and insulation coordination

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

TEXT BOOKS:

1. Padiyar, K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi 1990. First edition.
2. P.Kundur, 'Power System Stability and Control', Tata McGraw Hill Publishing Company Ltd., USA, 1994.
3. Arrillaga, J., High Voltage direct current transmission, Peter Pregrinus, London, 1983.

REFERENCES:

1. Edward Wilson Kimbark, Direct Current Transmission, Vol. I, Wiley interscience, New York, London, Sydney, 1971.
2. Rakosh Das Begamudre, Extra high voltage AC transmission engineering New

19153C43P- SOLID STATE DRIVES

3 1 0 4

Semester IV

AIM

To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

- i. To understand the stable steady-state operation and transient dynamics of a motor-load system.
- ii. To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
- iii. To study and understand the operation of both classical and modern induction motor drives.
- iv. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- v. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive.

UNIT I DRIVE CHARACTERISTICS

9

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II DC MOTOR DRIVE

9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III STATOR CONTROLLED INDUCTION MOTOR DRIVES

9

Variable terminal voltage control – Variable frequency control – V/f control - AC voltage controllers – Four-quadrant control and closed loop operation - Frequency controlled drives- VSI and CSI fed drives – closed loop control.

UNIT IV ROTOR CONTROLLED INDUCTION MOTOR DRIVES

9

Rotor resistance control – slip power recovery schemes - sub synchronous and super synchronous operations – closed loop control – Braking in induction motors.

UNIT V- SYNCHRONOUS MOTOR DRIVES

9

Wound field cylindrical rotor motor – operation from constant voltage and frequency source – operation from current source – operation from constant frequency – Brushless excitation – Permanent magnet synchronous motor.

Self-controlled Synchronous motor drives – Brushless dc and ac motor drives – CSI with load commutation – Cycloconverter with load commutation.

TOTAL = 45

COURSE OUTCOMES

Ability to understand and suggest a converter for solid state drive.

Ability to select suitability drive for the given application.

Ability to study about the steady state operation and transient dynamics of a motor load system. Ability to analyze the operation of the converter/chopper fed dc drive.

Ability to analyze the operation and performance of AC motor drives.

Ability to analyze and design the current and speed controllers for a closed loop solid

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.
2. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

REFERENCE BOOKS

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.
2. Vedam Subrahmanyam, "Electric drives concepts and applications", TMH Pub. Co.Ltd., 1994.
3. Murphy, J.M.D and Turnbull.F.G. , "Thyristor control of AC Motors", Pergamon Press, 1988.
4. Sen. P.C., "Thyristor D.C. Drives", John Wiley and Sons, 1981.

AIM

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems and To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of a DC servo motor & AC servo motor.
2. Analog simulation of type-0 and type-1 system, closed loop control system.
3. Digital simulation of linear systems & non-linear systems.
4. Design of P, PI and PID controllers,
5. Design of compensators.
6. Stability analysis of linear systems
7. Conduct test to find unknown inductance & capacitance using Maxwell's & Schering's bridges
8. Conduct test to find unknown Resistance using Wheat Stone & Kelvin's bridges.
9. Instrumentation amplifiers,
10. Conduct test to convert A/D signal using successive approximation type.
11. a) Conduct test to convert D/A signal using binary weighted resistor method.
b) Conduct test to convert D/A signal using R-2R Ladder method.
12. Calibration of single-phase energy meter & current transformer.

P = 45 Total = 45**COURSE OUTCOMES**

Ability to understand control theory and apply them to electrical engineering problems. Ability to analyze the various types of converters.

Ability to design compensators

Ability to study the simulation packages.

19153C51P-POWER SYSTEM ANALYSIS

3 1 0 4
Semester V

AIM

To become familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

OBJECTIVES

- i. To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
- ii. To model and analyse power systems under abnormal (fault) conditions.
- iii. To model and analyse the dynamics of power system for small-signal and large signal disturbances and to design the systems for enhancing stability.

UNIT I- THE POWER SYSTEM AN OVER VIEW AND MODELLING 12

Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system -Change of base.

UNIT II- POWER FLOW ANALYSIS 12

Introduction - Bus Classification - Bus admittance matrix - Solution of non-linear Algebraic equations - Gauss seidal method - Newton raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III-FAULT ANALYSIS-BALANCED FAULT 12

Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of the bus impedance matrix.

UNIT IV-FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND UNBALANCED FAULT 12

Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V-POWER SYSTEM STABILITY 12

Dynamics of a Synchronous machine – Swing equation and Power angle equation – Steady state Stability and Transient state Stability - Equal area criterion – Clearing angle and time- Numerical solution of Swing equation for single machine

Total = 60 Hrs

COURSE OUTCOMES

- Ability to model the power system under steady state operating condition
- Ability to understand and apply iterative techniques for power flow analysis
- Ability to model and carry out short circuit studies on power system
- Ability to model and analyze stability problems in power system

- | Ability to acquire knowledge on Fault analysis.
- | Ability to model and understand various power system components and carry out power flow, short circuit and stability studies

TEXT BOOKS:

1. Hadi Saadat “Power system analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, “Power System Stability and Control”, Tata McGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCE BOOKS:

1. I.J.Nagrath and D.P.Kothari, ‘Modern Power System Analysis’, Tata McGraw-Hill publishing company, New Delhi, 1990.
2. M.A. Pai, ‘Computer Techniques in power system Analysis’, Tata McGraw – Hill publishing company, New Delhi, 2003.
3. John J. Grainger and Stevenson Jr. W.D., ‘Power System Analysis’, McGraw Hill International Edition, 1994

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19153C52P - POWER QUALITY

3 1 0 4

Semester V

UNIT I INTRODUCTION TO POWER QUALITY 3

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES 10

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables.

UNIT IV HARMONICS 12

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 17

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic/spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L=45 Total=45

COURSE OUTCOMES

- Ability to understand and analyze power system operation, stability, control and protection.
- The students able to understand the over voltage protection & analysis tools used for analyzing the transients.
- They are fully trained in designing and evaluating the devices of harmonic distortion.

REFERENCE BOOKS

1. Roger.C.Dugan, Mark.F.McGranaghram, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCAD User Manual.

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SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of synchronous reluctance motors.
- ii. Construction, principle of operation and performance of stepping motors.
- iii. Construction, principle of operation and performance of switched reluctance motors.
- iv. Construction, principle of operation and performance of permanent magnet brushless D.C. motors.
- v. Construction, principle of operation and performance of permanent magnet synchronous motors.

UNIT I-SYNCHRONOUS RELUCTANCE MOTORS**9**

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.

UNIT II -STEPPING MOTORS**9**

Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits.

UNIT III-SWITCHED RELUCTANCE MOTORS**9**

Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control - characteristics – computer control.

UNIT IV-PERMANENT MAGNET BRUSHLESS D.C. MOTORS**9**

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

UNIT V-PERMANENT MAGNET SYNCHRONOUS MOTORS**9**

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

L=45 Total=45**COURSE OUTCOMES**

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
 - Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors.
 - Ability to construction, principle of operation, switched reluctance motors.

- Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.

TEXT BOOKS

1. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
2. Aearnley, P.P., 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCES

1. Kenjo, T., 'Stepping Motors and their Microprocessor Controls', Clarendon Press London, 1984.
2. Kenjo, T., and Nagamori, S., 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.

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19153L55P - POWER ELECTRONICS AND DRIVES LAB

Semester V

0 0 3 2

AIM

To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

1. Study Of V-I Characteristics Of An SCR.
2. Study Of V-I Characteristics Of A TRIAC.
3. Study Of Different Triggerring Circuits For Thyristor.
4. Study Of Uni- Junction Transistor (UJT) Triggerring Circuit.
5. Study Of A Firing Circuit Suitable For Single Phase Half Controlled Convertor.
6. Simulation On the Single Phase Ac-Dc Uncontrolled Convertor with & without the source Inductance.
7. Simulation Of A Single Phase Ac To Controlled Dc Convertor with & without the source Inductance.
8. Single Phase Half Controlled Bridge Convertor With Two Thyristors & Two Diodes.
9. Single Phase Fully Controlled Bridge Convertor Using Four Thyristors.
10. Pspice or MATH LAB Simulation Of Dc to Dc Step Down Chopper.
11. Pspice or MATH LAB Simulation Of Single Phase Controller with R-L Load.
12. Pspice or MATH LAB Simulation Of PWM Bridge Invertor Of R-L Load Using MOSFET.

COURSE OUTCOMES

Ability to practice and understand converter and inverter circuits and apply software for engineering problems.

Ability to analyze about AC to DC converter circuits.

Ability to analyze about DC to AC circuits.

Ability to acquire knowledge on AC to AC converters

Ability to acquire knowledge on simulation software.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

19153C61P- UTILIZATION OF ELECTRICAL ENERGY

3 1 0 4
Semester VI

AIM

To plan and design using basic principles and handbooks
To select equipment, processes and components in different situations.

OBJECTIVES

- i. To ensure that the knowledge acquired is applied in various fields as per his job requirements.
- ii. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize with the new developments in different areas.

UNIT I ELECTRIC LIGHTING 12

Production of light – Definition of terms – Lighting calculations – Types of lamps – Interior and Exterior illumination systems – Lighting schemes – Design of Lighting schemes – Factory lighting – Flood lighting – Energy saving measures.

UNIT II ELECTRIC HEATING 12

Resistance heating – Induction heating – Dielectric heating – Arc furnace – Control equipment, efficiency, and losses – Energy conservation in Arc Furnace Industry.

UNIT III ELECTRIC WELDING 12

Welding equipment – Characteristics of carbon and metallic arc welding – Butt welding – Spot welding – Energy conservation in welding.

UNIT IV ELECTRIC VEHICLE 12

Traction: System of track electrification, train movement and energy consumption (speed time curves, crest speed, average speed and schedule speed) rective effort, factors affecting energy consumption (dead weight, acceleration weight and adhesion weight) starting and braking of traction motors, protective devices

UNIT V ELECTRO CHEMICAL PROCESS 12

Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, efficiency – Batteries – Types – Charging methods.

Total = 60

COURSE OUTCOMES

To understand the main aspects of generation, utilization and conservation.

To identify an appropriate method of heating for any particular industrial application.

To evaluate domestic wiring connection and debug any faults occurred.

To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.

Text Books:

1. Tripathy,S.C., “Electric Energy Utilization & Conservation” – Tata McGraw Hill Publishing Company.
2. Uppal,S.L., “Electric Power”, Khanna Publishers.
3. Soni,M.L., P.V.Gupta & Bhatnagar , “A course in Electric Power”, Dhanpat Rai & Sons.

Reference Books:

1. Partab,H., “Art & Science Utilization of Electrical Energy” – Dhanpat Rai & Sons.
2. Wadhwa,C.L., “Generation, Utilization & Distribution” - Wilsey Eastern Ltd.
3. Wadha C L - Utilization of Electric Power; New Age International
4. Suryanarayana . N.V., “Utilization of Electric Power” - Wilsey Eastern Ltd.

UNIT 1	9
Advantages of Static Relays – Generalized Characteristics and Operational Equations of Relays – Steady State and Transient Performance of Signal Driving Elements – Signal Mixing Techniques and Measuring Techniques – CT’s and PT’s in Relaying Schemes – Saturation Effects.	
UNIT 2	9
Static Relay Circuits (Using Analog and Digital IC’s) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.	
UNIT 3	9
Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.	
UNIT 4	9
Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.	
UNIT 5	9
Microprocessor Based Relays – Hardware and Software for the Measurement of Voltage, Current, Frequency, Phase Angle – Microprocessor Implementation of Over Current Relays – Inverse Time Characteristics – Impedance Relay – Directional Relay – MHO Relay.	

Total=45**COURSE OUTCOMES**

- Ability to suggest suitability circuit breaker.
- Ability to find the causes of abnormal operating conditions of the apparatus and system.

Text Books:

1. Badriram and Vishwakarma D.N., Power System Protection and Switchgear, Tata McGraw Hill, New Delhi, 1995.
2. Rao T.S.M., Power System Protection – Static Relays, McGraw Hill, 1979.

Reference Books:

1. Van C.Warrington, “Protection Relays – Their Theory and Practice”, Chapman and Hall.
2. Ravindranath B. and Chander M., “Power System Protection and Switchgear”, Wiley Eastern, 1992.
3. Russel C.Mason, “The Art and Science of Protective relays”.

19153C63P- POWER SYSTEM OPERATION AND CONTROL

4 0 0 4

Semester VI

AIM

To become familiar with the preparatory work necessary for meeting the next day's operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVES

- i. To get an overview of system operation and control.
- ii. To understand & model power-frequency dynamics and to design power-frequency controller.
- iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNIT I INTRODUCTION 12

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 12

Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC of single & Multi areas - Static & Dynamic Analysis of uncontrolled and controlled cases -Tie line with frequency bias control – Steady state instabilities.

UNIT III REACTIVE POWER-VOLTAGE CONTROL 12

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ -iteration method. (No derivation of loss coefficients.) Base point and participation factors.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies. **Total = 60**

COURSE OUTCOMES

Ability to understand the day-to-day operation of electric power system.

Ability to analyze the control actions to be implemented on the system to meet the minute- to-minute variation of system demand.

Ability to understand the reactive power-voltage interaction.

TEXT BOOKS

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
3. P. Kundur, 'Power System Stability & Control', McGraw Hill Publications, USA, 1994.

REFERENCE BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

AIM

To simulate analysis and planning cases for a practical power system.

List Of Experiments:

1. Formation of Y-Bus Matrix by Inspection and Singular transformation methods.
2. Load flow solution using Gauss Seidal method
3. Load flow solution using Newton-Raphson method
4. Load flow solution by Fast Decoupled method
5. Symmetrical short circuit analysis
6. Unsymmetrical Fault analysis
7. Solution of swing Equation using modified Euler method
8. Power Electronic Circuits, design and simulation using Pspice
9. Simulation of Electrical drives using MATLAB, PSCAD
10. Control system design using MATLAB

P = 45 Total = 45

COURSE OUTCOMES

Ability to understand power system planning and operational studies.

Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks.

Ability to analyze the power flow using GS and NR method

Ability to find Symmetric and Unsymmetrical fault

Semester VII

UNIT – I: BASICS OF TQM**9**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT – II: PRINCIPLES OF TQM**9**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT – III: QUALITY CONCEPTS**9**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Concept of six sigma,

UNIT – IV: TQM TOOLS**9**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages of FMEA.

UNIT – V: ISO STANDARDS**9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45**COURSE OUTCOMES**

Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. Dale H. Besterfield, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker, “TOTAL QUALITY MANAGEMENT”, Anuradha Agencies.

REFERENCES:

1. Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.

2. Oakland.J.S. "Total Quality Management", Butterworth – Heinemann Ltd., Oxford. 1989.
3. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 1996

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

- i. Construction, principle of operation and performance of DC machine.
- ii. Construction, operating Characteristics of single and three phase transformer.
- iii. Design and operating characteristics of Induction motors.
- iv. Construction, principle of operation, Design of synchronous machines and to have knowledge of machine design in CAD

UNIT I INTRODUCTION 12

Major considerations – Limitations – Electrical Engineering Materials – Space factor – temperature gradient – Heat flow in two dimensions – thermal resistivity of winding – Temperature gradient in conductors placed in slots – Rating of machines – Eddy current losses in conductors – Standard specifications

UNIT II DC MACHINES 12

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes – losses and efficiency calculations.

UNIT III TRANSFORMERS 12

KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise of Transformers – Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 12

Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current – Output equation of Induction motor – Main dimensions –Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor-Operating characteristics –Short circuit current – circle diagram – Dispersion co-efficient – relation between D & L for best power factor.

UNIT V SYNCHRONOUS MACHINES 12

Runaway speed – construction – output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding –

Determination of full load field m.m.f – Design of field winding – Design of turbo alternators – Rotor design - Introduction to computer aided design – Program to design main dimensions of Alternators.

Total = 60

COURSE OUTCOMES

Ability to understand basics of design considerations for rotating and static electrical machines

Ability to design of field system for its application.

Ability to design single and three phase transformer.

Ability to design armature and field of DC machines.

REFERENCE BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

19153C73P- POWER PLANT ENGINEERING

4 0 0 4

Semester VII

UNIT I -THERMAL POWER PLANTS 9

Basic thermodynamic cycles – Various components of steam power plant – Layout – Pulverized coal burners – Fluidized bed combustion – Coal handling systems – Ash handling systems – Forced draft and induced draft fans – Boilers – Feed pumps – Super heater – Regenerator – Condenser – Deaerators – Cooling tower

UNIT II - HYDRO ELECTRIC POWER PLANTS 9

Layout – Dams – Selection of water turbines – Types – Pumped storage hydel plants

UNIT III - NUCLEAR POWER PLANTS 9

Principles of nuclear energy – Fission reactions – Nuclear reactor – Nuclear power plants

UNIT IV- GAS AND DIESEL POWER PLANTS 9

Types – Open and closed cycle gas turbine – Work output and thermal efficiency – Methods to improve performance – Reheating, intercoolings, regeneration – Advantage and disadvantages – Diesel engine power plant – Component and layout

UNIT V- NON – CONVENTIONAL POWER GENERATION 9

Solar energy collectors – OTEC – Wind power plants – Tidal power plants and geothermal resources – Fuel cell – MHD power generation – Principle – thermoelectric power generation – Thermionic power generation.

L: 45 T: 15 Total: 60

COURSE OUTCOMES

- Ability to create awareness about renewable Energy Sources and technologies.
- Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- Ability to recognize current and possible future role of renewable energy sources.

TEXT BOOKS

1. Arora and Domkundwar, “A Course in Power Plant Engineering”, Dhanpat Rai.
2. Nag, P.K., “Power Plant Engineering”, 2nd Edition, Tata McGraw Hill, 2003.

REFERENCES

1. Bernhardt, G.A., Skrotzki and William A. Vopat, “Power Station Engineering and Economy”, 20th Reprint, Tata McGraw Hill, 2002.
2. Rai, G.D., “An Introduction to Power Plant Technology”, Khanna Publishers.
3. El-Wakil, M.M., “Power Plant Technology”, Tata McGraw Hill, 198

19153E44AP-FIELD THEORY3 1 0 4
Semester-IV**AIM**

To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering.

OBJECTIVES: To impart knowledge on

- i. Concepts of electrostatics, electrical potential, energy density and their applications.
- ii. Concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
- iii. Faraday's laws, induced emf and their applications.
- iv. Concepts of electromagnetic waves and Pointing vector.

UNIT I: INTRODUCTION**12**

Introduction-Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Electric flux density-Gauss's law and application – Electrical potential –potential gradient– Divergence & Divergence theorem- Poisson's and Laplace's equations

UNIT II: STATIC ELECTRI FIELD**12**

Field due to dipoles- dipole moment-current & current density-conductors and dielectric –boundary conditions– Capacitance-Dielectric Dielectric interface- capacitance of a system of conductors- Dielectric constant and dielectric strength- Energy stored in a capacitor- Energy density.

UNIT III: MAGNETOSTATICS**12**

Introduction- Biot-savart Law- Ampere's Circuital Law-Curl- Stoke's theorem-Magnetic flux- – Magnetic flux density (B)- Scalar and vector potential – Force on a moving charge and current elements- force & Torque on closed circuits.

UNIT IV: ELECTROMAGNETIC INDUCTION**12**

Introduction to magnetic materials – Magnetization and permeability- Magnetic Boundary conditions- Magnetic circuits-Potential energy and forces on magnetic materials.- Faraday's laws- Inductance & mutual inductance- Inductance of solenoid, toroid and transmission lines.

UNIT V: ELECTROMAGNETICS**12**

Conduction current and - Displacement current-, Maxwell's equations (differential and integral forms) -Wave propagation in free space, lossy and lossless dielectrics- Power and Poynting vector – Propagation in good conductors- wave polarization.

TOTAL = 60**COURSE OUTCOMES**

Ability to understand the basic mathematical concepts related to electromagnetic vector fields. Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.

□ Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.

Ability to understand the different methods of emf generation and Maxwell's equations

Ability to understand the basic concepts electromagnetic waves and characterizing parameters Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition, 1991.
2. William .H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.

REFERENCE BOOKS

1. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
4. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 1995.

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19153E44BP- FUZZY LOGIC AND ITS APPLICATIONS**3 1 0 4**

Semester-IV

UNIT I -FUZZY LOGIC**7**

Fuzzy sets – Fuzzy operation – Fuzzy arithmetic – Fuzzy relational equations – Fuzzy measure – Fuzzy functions – approximate reasoning – Fuzzy proposition – Fuzzy quantifiers-if-then rules.

UNIT II- FUZZY LOGIC IN CONTROL**8**

Structure of Fuzzy logic controller – Fuzzification models – database – rule base – inference engine – defuzzification modules – Non-Linear fuzzy control – PID like FLC – Sliding mode FLC – Sugeno FLC – adaptive fuzzy control applications – case studies.

UNIT III- NEURAL NETWORKS IN CONTROL**8**

Neural Network for Non-Linear systems – schemes of Neuro control-system identification forward model and inverse model – indirect learning neural network control applications – Case studies.

UNIT IV- MODELING AND CONTROL OF FACTS DEVICES NEURAL AND FUZZY TECHNIQUE**10**

FACTS-concept and general system considerations, types of FACTS devices – special purpose FACTS devices, generalized and multifunctional FACTS devices – General comments on transient stability programs. Neuro – Fuzzy based FACTS controller for improvement of Transient stability systems – GA for Adaptive fuzzy system – case study.

UNIT V- STABILITY STUDIES UNDER MULTIPLE FACTS ENVIRONMENT**12**

Introduction to small signal analysis – simulation and modeling of FACTS controllers for small signal analysis. Comparison between dynamic and transient stability results. Introduction to EMTP – (Electromagnetic Transient programme / Package), Modeling of FACTS controllers for power system studies using EMTP.

TOTAL=45**COURSE OUTCOMES**

- | Ability to design combinational and sequential Circuits.
- | Ability to simulate using software package.
- | Ability to study various number systems and simplify the logical expressions using Boolean functions
- | Ability to design various synchronous and asynchronous circuits.
- |

Ability to introduce asynchronous sequential circuits and PLDs

Ability to introduce digital simulation for development of application oriented logic circuits.

REFERENCES:

1. KOSKO. B. “Neural Networks and Fuzzy systems”, Prentice-Hall of India Pvt.Ltd., 1994.
2. Driankov, Hellendroon, “Introduction to Fuzzy control” Narosa Publisher.
3. Ronald R.Yager and Dimitar P.Filev “Essential of fuzzy modeling and control “ John Wiley & Sons, Inc.
4. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho” FACTS – Modeling and simulation in Power Networks” John Wiley & Sons.
5. Kundur P., “Power system stability and control”, McGraw Hill, 1994.

19153E44CP - BIOMEDICAL INSTRUMENTATION**4 0 0 4****Semester-IV****AIM**

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

- i. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
- ii. To introduce the student to the various sensing and measurement devices of electrical origin.
- iii. To provide the latest ideas on devices of non-electrical devices.
- iv. To bring out the important and modern methods of imaging techniques.
- v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I BASIC PHYSIOLOGY 9

Cells and their structures – Transport of ions through cell membrane – Resting and excited state – Tran membrane potential – Action potential – Bio-electric potential – Nervous system – Physiology of muscles – Heart and blood circulation – Respiratory system – Urinary system.

UNIT II BASIC TRANSDUCER PRINCIPLES AND ELECTRODES**9**

Transducer principles - Active transducers - Passive transducers -Transducer for Bio-medical application -Electrode theory- Bio-potential electrode - Bio - chemical transducer.

UNIT III CARDIOVASCULAR SYSTEM 9

The heart and cardiovascular system – Blood pressure – Characteristics of blood flow – Heart sounds - Electro cardiography – Measurements of blood pressure – Measurement of blood flow and cardiac O/P Plethysmography – Measurements of heart sounds.

UNIT IV X-RAY AND RADIOISOTOPE INSTRUMENTATION 9

X-ray imaging radiography – Fluoroscopy – Image intensifiers – Angiography - Medical use of radioisotopes – Beta radiations – Detectors – Radiation therapy.

UNIT V BIO-TELEMETRY 9

Introduction to biotelemetry – Physiological parameters adaptable to biotelemetry – the components of biotelemetry systems – Implantable units – Applications of telemetry in patient care – Application of computer in Bio-medical instrumentation, Anatomy of Nervous system – Measurement from the nervous system – EEG – EMG.

Total = 45

COURSE OUTCOMES

- Ability to understand fundamentals of Bio medical instrumentation.
- To acquire knowledge on Bio-Medical and Non-Electrical parameter measurements.
- To know the various medical imaging equipment.

REFERENCE BOOKS:

1. Lesis Cromwell Fred, J.Werbell and Erich A.Pfrafraffer, Biomedical instrumentation and Measurements – Prentice Hall of India, 1990.
2. M.Arumugam, Bio-medical Instrumentation – Anuradha Agencies Publishers, 1992.
3. Khandpur, Handbook on Biomedical Instrumentation – Tata McGraw Hill Co Ltd., 1989.

**19153E44DP - MODELING AND SIMULATION OF SOLAR ENERGY
SYSTEMS**

4 0 0 4

UNIT I: SOLAR RADIATION AND COLLECTORS

9

Solar angles - day length, angle of incidence on tilted surface - Sunpath diagrams - shadow determination - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT I: APPLICATIONS OF SOLAR THERMAL TECHNOLOGY

9

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying.

UNIT III: SOLAR PV FUNDAMENTALS

9

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetero junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell – efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells - preparation of metallurgical, electronic and solar grade Silicon - production of single crystal Silicon: Czochralski (CZ) and Float Zone (FZ) method - Design of a complete silicon – GaAs- InP solar cell - high efficiency III-V, II-VI multi junction solar cell; a-Si-H based solar cells-quantum well solar cell -thermophotovoltaics.

UNIT IV: SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS

9

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking – use of computers in array design - quick sizing method - array protection and trouble shooting - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT V: SOLAR PASSIVE ARCHITECTURE

9

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - radiative cooling - application of wind,

water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort – concept of solar temperature and its significance - calculation of instantaneous heat gain through building envelope.

TOTAL: 45

COURSE OUTCOMES

Basic knowledge in Power system planning, operation and modeling of large scale power systems.

Ability to understand the various faults occurring in power system and to solve load flow problems using numerical methods.

Ability to analyze the power system transients and faults and select the rating for protective devices.

TEXT BOOKS:

1. Sukhatme S P, Solar Energy, Tata McGraw Hill, 1984.
2. Kreider, J.F. and Frank Kreith, Solar Energy Handbook, McGraw Hill, 1981.
3. Goswami, D.Y., Kreider, J. F. and Francis., Principles of Solar Engineering, 2000.

REFERENCES:

1. Garg H P., Prakash J., Solar Energy: Fundamentals & Applications, Tata BMcGraw Hill, 2000.
2. Duffie, J. A. and Beckman, W. A., Solar Engineering of Thermal Processes, John Wiley, 1991.
3. Alan L Fahrenbruch and Richard H Bube, Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press, 1983.
4. Larry D Partain, Solar Cells and their Applications, John Wiley and Sons, Inc, 1995.
5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2004.
6. Sodha, M.S, Bansal, N.K., Bansal, P.K., Kumar, A. and Malik, M.A.S. Solar Passive Building, Science and Design, Pergamon Press, 1986.
7. Krieder, J and Rabi, A., Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.

19153E44EP NON-CONVENTIONAL ENERGY SYSTEMS AND APPLICATIONS

2024

AIM

To learn about the Renewable energy system and conversion technologies related to various aspects of non-conventional systems.

OBJECTIVES

- to identify suitable utility for the solar and wind energy systems,
- to conduct a site survey for installation of a windmill during Sixth Expedition ,
- to study the structural and foundation aspects for installing a windmill at Maitree station in Schirmacher hills

UNIT-I

9

Introduction to renewable energy various aspects of energy conversion-Principle of renewable energy systems environment and social implications

UNIT-II

9

Solar energy: Solar radiation components- measurements-estimation-solar collectors-solar water heaters- Calculation-Types-analysis-economics-Applications Solar thermal power generation Solar Photovoltaics- energy conversion principle-classifications-equivalent circuit-characteristics-Cell efficiency- Limitations-PV modules-MPPT algorithms

UNIT-III

9

Wind energy: Basics of wind-wind turbines-power and energy from wind turbine-characteristics- types of electric generators for wind power generation. Dynamics matching- performance of wind generators - applications- economics of wind power

UNIT-IV

9

Storage Devices: Super capacitor-SMES- Battery storage-flywheel storage- compressed air storage- Fuel cells-types and applications; MHD generators – backup -System design-industrial and domestic applications.

UNIT-V

9

Bioenergy: Bio fuels-classification-biomass conversion technologies-applications; Ocean Energy: Tidal energy-wave energy-ocean thermal energy conversion systems-applications; - mini, micro and pico hydel power

Total : 45

TEXT/REFERENCE BOOKS:

1. Godfrey Boyle, "Renewable Energy: Power for a sustainable future", Oxford University press, Second edition.
2. Rai G D, "Solar Energy Utilization", Khanna Publishers, 1997.
3. B H Khan, "Non-Conventional Energy Resources", The McGraw-Hill Companies, Second Edition.
4. Sukhatme, S.P, "Solar Energy -Principles of Thermal Collection and Storage", Tata
5. McGraw-Hill, 2 ed., 1997.
6. Sammes, Nige, "Fuel Cell Technologies-State and Perspectives", Springer publication, 2005
7. Kreith, F., and Kreider, J.F., "Principles of Solar Engineering", Mc-Graw-Hill Book Co, 1978.
8. S.L.Soo , "Direct Energy Conversion" , Prentice Hall Publication, 1968
9. James Larminie, Andrew Dicks, "Fuel Cell Systems", Wiley & Sons Ltd, 2ed, 2003.

19153E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNIT I- INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineral resources: use and effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT II-ECOSYSTEMS AND BIODIVERSITY

14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem. Introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III -ENVIRONMENTAL POLLUTION

8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards — role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV-SOCIAL ISSUES AND THE ENVIRONMENT

7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management
environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. environment production act – air (prevention and control

of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

UNIT V-HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – hiv / aids – women and child welfare – role of information technology in environment and human health – case studies.

TOTAL : 45

COURSE OUTCOMES

- Play a important role in transferring a healthy environment for future generations
- Analyze the impact of engineering solutions in a global and societal context
- Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems

TEXT BOOKS

1. Gilbert M .Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., Ahmedabad India.
2. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. “Environmental Management”, W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, “Essentials of Ecology, Blackwell Science.
6. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

19153E54BP -ARTIFICIAL NEURAL NETWORKS

4 0 0 4

UNIT I : INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 12

Biological neural networks - Pattern analysis tasks: Classification, Regression, Clustering
- Computational models of neurons - Structures of neural networks - Learning principles

UNIT II: LINEAR MODELS FOR REGRESSION AND CLASSIFICATION 12

Polynomial curve fitting - Bayesian curve fitting - Linear basis function models - Bias-variance decomposition - Bayesian linear regression - Least squares for classification - Logistic regression for classification- Bayesian logistic regression for classification

UNIT III: FEEDFORWARD NEURAL NETWORKS 12

Pattern classification using preceptor - Multilayer feed forward neural networks (MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back propagation learning - Fast learning methods: Conjugate gradient method – Auto associative neural networks - Bayesian neural networks

UNIT III: RADIAL BASIS FUNCTION NETWORKS 12

Regularization theory - RBF networks for function approximation - RBF networks for pattern classification

UNIT IV: KERNEL METHODS FOR PATTERN ANALYSIS 12

Statistical learning theory- Support vector machines for pattern classification- Support vector regression for function approximation- Relevance vector machines for classification and regression

UNIT V: SELF-ORGANIZING MAPS 12

Pattern clustering- Topological mapping- Kohonen's self-organizing map

FEEDBACK NEURAL NETWORKS

Pattern storage and retrieval- Hopfield model- Boltzmann machine- Recurrent neural networks

TOTAL=60

COURSE OUTCOMES

- Analysis of transients using various parametric & non parametric methods.

- Analysis of various control schemes used for controlling applications
- study about the adaptive control systems for various applications & study of issues in it.

Text Books:

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999
2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

19153E54CP-COMMUNICATION ENGINEERING 3 1 0 4

UNIT I 9
Need for Modulation, Amplitude Modulation, AM Demodulator, SSB Modulation, Vestigial Sideband Modulation, AM transmitter and Receiver, Noise and bandwidth in AM, Carrier Communication, Basic Principles of Pulsed and CW Radar.

UNIT II 9
Frequency Modulation, FM Demodulator, Phase Modulation, FM transmitter and receiver, Noise and bandwidth in FM, Ground wave, sky wave and space wave propagation, Basic Principles of BW and Colour TV.

UNIT III 9
Sampling theorem, PAM, PWM, PPM, Pulse Code Modulation, Noise in PCM, Delta Modulation, Adaptive Delta modulation, DPCM, M'ary system, FDM and TDM.

UNIT IV 9
Digital Modulation, ASK, FSK, PSK, DPSK, Basic Principles of Optical Communication, Satellite Comm., Mobile Comm.

UNIT V 9
Entropy, Mutual Information, Channel Capacity, Shannon Theorem, Shannon-Hartley Theorem, Shannon-Fano code, Huffman code, Parity Check Code, Hamming's Single Error Correction Code.

TOTAL 45

COURSE OUTCOMES

- The student will know about different analog modulation techniques and also about their transmitter, receivers
- The students will know about the principles behind different digital modulation techniques
- The student will know about different Multiplexing and Spread spectrum techniques.

REFERENCE BOOKS:

1. Electronics Communication System - G.Kennedy
2. Communication System-Analog & Digital - R.P.Singh & S.D.Sapre

19153E54DP- ROBOTICS

3 1 0 4

UNIT I: INTRODUCTION

9

Robot ,its evaluation; definition and aes of robotics, present application status.

UNIT II: ROBOT ANATOMY

9

configuration, robot motions, work volume. Robot drives, actuators and control; Functions and types of drives and actuators; concept of basic control systems, open loop, close loop, different type of controllers, ON-OFF, proportional, integral, PI, PD, PID.

UNIT III: ROBOT END EFFECTORS:

9

Types of end effecters, mechanical gripper, tools and end effectors. Robot sensors: Transducers and sensors; analog and digital transducers; types of sensors, tachfile sensors, proximity and rough sensors ; miscellaneous sensors; vision systems; use of sensors in robotics.

UIT IV: ROBOT KINEMATICS

9

Position representations; forward and reverse kinematics of three and four degrees of freedom; robot arm; homogeneous transformations and robot kinematics; kinematics equations using homogeneous transformation .

UNIT V: INDUSTRIAL APPLICATION

9

Capabilities of robots; robot applications; materials handling; pick and place operation; palletiging and depalletiging; machine loading and unloading; machine casting; welding;painting,assembly; inspection; maintenance.

COURSE OUTCOMES

- Ability to understand and develop MFC windows applications with inputs and drawing features and implement menus using VC++
- Ability to understand document/view architecture and develop classic controls using VC++
- Ability to understand and design event driven programming and activeX controls and manage database using visual basic

BOOKS RECOMMENDED:

- 1.Schilling-Fundamental of robotics; PH
- 2.Yoshikawa- Fundamental of robotics; PH
3. S.R.Deb-Robotics Technology and Flexible Automation
4. Introduction to Robotics, John J Craig; Pearson Education

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

To develop expression for computation of fundamental parameters of Power system analysis.

To categorize the lines into different classes and develop equivalent circuits for these classes.

To analyze the voltage distribution in Architectures and user interface.

UNIT-I**9**

Power system-general concepts-distribution of power, load and energy forecasting-factors in power system loading, Power system analysis-load flow-fault studies-voltage control.

UNIT-II**9**

Optimization of distribution system network cost modeling-economic loading of distribution transformers. Distribution system reliability-reliability assessment techniques

UNIT-III**9**

Consumer services-maximum demand, diversity and load factor-consumer load control for power shortages, Tariffs-costing and pricing –economically efficient tariff structure. Overhead and underground lines-optimum design considerations, Power capacitors-size of capacitor for power factor improvement- HT and LT capacitor installation requirements.

UNIT-IV**9**

Distribution System Design- Electrical Design Aspects of Industrial, Commercial Buildings- Design, estimation and costing of outdoor and indoor Substations, Electrical Safety and Earthing Practices at various voltage levels- Lightning protection.-Regulations and standards.

UNIT-V**9**

Distribution Automation System : Necessity, System Control Hierarchy- Basic Architecture and implementation Strategies for SCADA and DAC systems -Basic Distribution Management System Functions. Communication Systems for Control and Automation- Wireless and wired Communications- SCADA and DAC communication Protocols, Architectures and user interface

Total: 45

Text/References:

1. Turan Gonen, "Electric Power Distribution system Engineering" Mc Graw-hill ,Inc,1987
2. A.S. Pabla, " Electric Power Distribution systems" Tata Mc Graw-hill Publishing company limited, 4th edition, 1997.
3. Alexander Eigeles Emanuel, "Power Definitions and the Physical Mechanism of Power Flow", John Wiley & Sons, October 2009.
4. "Handbook of International Electrical Safety Practices", John Wiley & Sons, PERI June 2009.
5. Ali A. Chowdhury, Don O. Koval, "Power distribution system reliability-Practical methods and applications" John Wiley & sons Inc., *IEEE Press* 2009
6. Richard E.Brown, "Electric power distribution reliability" Taylor & Francis Group,LLC,2009.
7. James Northcote-Green, Robert Wilson, "Control and automation of electrical power distribution system", Taylor & Francis Group, LLC,2007.
8. S.Sivanagaraju, V.Sankar, Dhanpat Rai & Co, "Electrical Power Distribution and Automation",2006.
9. Pansini,Anthony J, "Guide to electrical power distribution system",Fairmont press, inc., 6th edition,2006.
10. Stuart A. Boyer, "SCADA-Supervisory Control and Data Acquisition" Instrument Society of America Publication,2004
11. Leveque, Francois , "Transport Pricing of Electricity Networks" Springer 2003
13. Lakervi & E J Holmes, "Electricity distribution network design", Peter Peregrinus Ltd. 2nd Edition,2003
13. William H. Kersting, "Distribution system modeling and analysis" CRC press LLC, 2002.
14. Michael Wiebe, "A Guide to Utility Automation: Amr, Scada, and It Systems for Electric Power" PennWell,1999.
15. IEEE Press: IEEE Recommended practice for Electric Power Distribution for Industrial Plants, publish

19153E64AP- PRINCIPLES OF MANAGEMENT 4 0 0 4

OBJECTIVE

- i. To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- ii. To understand the statistical approach for quality control.
- iii. To create an awareness about the ISO and QS certification process and its need for the industries

UNIT I HISTORICAL DEVELOPMENT 12

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 12

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 12

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 12

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques –Job Enrichment – Communication – Process of Communication – Barriers and Breakdown –Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 12

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL = 60

COURSE OUTCOMES

- Basic Knowledge on management, business, organization culture, environment and planning process.
- Ability to organize business activities, motivational techniques and effective communication.
- Ability to understand the management control and budgetary techniques.

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCE BOOKS

1. Tripathy PC And Reddy PN, “ Principles of Management”, Tata Mcgraw Hill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Resources Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “ Engineering Management”, Addison Wesley,-2000.

19153E64BP- PROFESSIONAL ETHICS

4 0 0 4

AIM :

To ensure that the required technical knowledge and skills can be learnt .

OBJECTIVES :

- i. To create an awareness on Engineering Ethics and Human Values.
- ii. To instill Moral and Social Values and Loyalty
- iii. To appreciate the rights of Others

UNIT I HUMAN VALUES

9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES

9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

Total = 45

COURSE OUTCOMES

- Understand the ethical theories and concepts
- Understanding an engineer's work in the context of its impact on society
- Understand and analyze the concepts of safety and risk
- Understand the professional responsibilities and rights of Engineers

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “ Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “ Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “ Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “ Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001 .

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19153E64CP INTEGRATED OPTO-ELECTRONIC DEVICES 3 1 0 4

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVE

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To understand different light modulation techniques and the concepts and applications of optical switching.

UNIT I: ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT III: OPTICAL DETECTION DEVICES 9

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated circuits, integrated transmitters and Receivers, Guided wave devices.

COURSE OUTCOMES

- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to know the basic properties of laser and to apply for industry.
- Recognize the importance of laser in medicinal and industry applications.

TEXTBOOK

1. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall of India Pvt. Ltd.,NewDelhi,1995.

REFERENCES

1. Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., NewDelhi,1995.
2. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, McGraw-Hill International Edition, 1998.

19153E64DP -COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS

3 1 0 4

AIM

To introduce the basics of Computer Aided Design technology for the design of Electrical Machines.

OBJECTIVE

At the end of this course the student will be able to

Learn the importance of computer aided design method.

Understand the basic electromagnetic field equations and the problem formulation for CAD applications.

Become familiar with Finite Element Method as applicable for Electrical Engineering.

Know the organization of a typical CAD package.

Apply Finite Element Method for the design of different Electrical apparatus.

UNIT I: INTRODUCTION 12

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II: MATHEMATICAL FORMULATION OF FIELD PROBLEMS 12

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNIT III: PHILOSOPHY OF FEM 12

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variation method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques.

UNIT IV: CAD PACKAGES 12

Elements of a CAD System –Pre-processing – Modeling – Meshing – Material properties- Boundary Conditions – Setting up solution – Post processing.

UNIT V: DESIGN APPLICATIONS 12

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

COURSE OUTCOMES

The students will obtain the knowledge of basic electric and magnetic materials and design of rotating electrical Machines and Transformers.

The students will be able to overall design the machines and transformers.

The students will gain knowledge about the various types of electrical machines and design of both ac & dc Machines and many application.

TEXT BOOKS

1. S.J Salon, 'Finite Element Analysis of Electrical Machines', Kluwer Academic Publishers, London, 1995.
2. Nicola Bianchi, 'Electrical Machine Analysis using Finite Elements', CRC Taylor & Francis, 2005.

REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, 'Electromagnetic Modeling by Finite Element Methods', Marcell Dekker Inc., 2003.
2. P.P.Silvester and Ferrari, 'Finite Elements for Electrical Engineers', Cambridge University Press, 1983.
3. D.A.Lowther and P.P Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, New York, 1986.
4. S.R.H.Hoole, 'Computer Aided Analysis and Design of Electromagnetic Devices', Elsevier, New York, 1989.
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.

19153E64EP ADVANCED DC-AC POWER CONVERSION 2024

AIM

To study advanced DC-AC power conversion technologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I TWO-LEVEL VOLTAGE SOURCE INVERTER 9

Introduction - **Sinusoidal PWM** - Modulation Scheme - Harmonic Content – Over-modulation – Third Harmonic Injection PWM - **Space Vector Modulation** - Switching States - Space Vectors - Dwell Time Calculation - Modulation Index - Switching Sequence - Spectrum Analysis - Even-Order Harmonic Elimination - Discontinuous Space Vector Modulation

UNIT-II CASCADED H-BRIDGE (CHB) MULTILEVEL INVERTERS 9

Introduction - **H-Bridge Inverter** - Bipolar Pulse-Width Modulation - Unipolar Pulse-Width Modulation – **Multilevel Inverter Topologies** - CHB Inverter with Equal dc Voltage - H-Bridges with Unequal dc Voltages.

Carrier Based PWM Schemes - Phase-Shifted Multicarrier Modulation - Level-Shifted Multicarrier Modulation - Comparison Between Phase- and Level-Shifted PWM Schemes - Staircase Modulation.

UNIT-III DIODE-CLAMPED MULTILEVEL INVERTERS 9

Introduction - **Three-Level Inverter** - Converter Configuration - Switching State - Commutation - Space Vector Modulation - Stationary Space Vectors - Dwell Time Calculation - Relationship Between V_{ref} Location and Dwell Times - Switching Sequence Design - Inverter Output Waveforms and Harmonic Content - Even-Order Harmonic Elimination - **Neutral-Point Voltage Control** - Causes of Neutral-Point Voltage Deviation – Effect of Motoring and Regenerative Operation - Feedback Control of Neutral-Point Voltage

UNIT-IV 9

Other Space Vector Modulation Algorithms - Discontinuous Space Vector Modulation - SVM Based on Two-level Algorithm **High-Level Diode-Clamped Inverters** - Four- and Five-Level Diode-Clamped Inverters - Carrier-Based PWM – **Other Multilevel Voltage Source Inverters** – **Introduction - NPC/H-Bridge Inverter - Inverter** Topology - Modulation Scheme - Waveforms and Harmonic Content - **Multilevel Flying-Capacitor Inverters** – Inverter Configuration - Modulation Schemes

UNIT-V PWM CURRENT SOURCE INVERTERS 9

Introduction - PWM Current Source Inverter - Trapezoidal Modulation - Selective Harmonic Elimination - **Space Vector Modulation** - Switching States - Space Vectors - Dwell Time Calculation - Switching Sequence - Harmonic Content - SVM Versus TPWM and SHE - **Parallel Current Source Inverters** - Inverter Topology - Space Vector Modulation for Parallel Inverters - Effect of Medium Vectors on dc Currents - dc Current Balance Control - Load-Commutated Inverter (LCI)

Total: 45

TEXT/REFERENCE BOOKS:

1. B. Woo, "High Power Converters and AC Drives", John Wiley & Sons, 2006
2. Ned Mohan et.al, "Power Electronics" ,John Wiley and Sons,2006
3. Rashid, "Power Electronics, Circuits Devices and Applications", Pearson Education, 3rd edition, 2004.
4. G.K.Dubey, Thyristorised Power Controllers, Wiley Eastern Ltd, 1993.
5. Dewan & Straughen, Power Semiconductor Circuits, John Wiley & Sons, 1975.
6. Cyril W Lander, Power Electronics, Mc Graw Hill, 3rd edition, 1993.

19153E74AP - POWER SYSTEM TRANSIENTS

3 0 0 3

Semester VII

AIM

To understand generation of switching and lightning transients, their propagation, reflection and refraction on the grid and their impact on the grid equipment.

OBJECTIVES

- i. To study the generation of switching transients and their control using circuit – theoretical concept.
- ii. To study the mechanism of lightning strokes and the production of lightning surges.
- iii. To study the propagation, reflection and refraction of travelling waves.
- iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 7

Various types of power system transients - effects of transients on power systems.

UNIT II LIGHTNING AND SWITCHING SURGES 19

Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNIT III MODELLING OF POWER SYSTEM EQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNIT IV COMPUTATION OF TRANSIENT OVERVOLTAGES 14

Computation of transients – traveling wave method, Bewley's lattice diagram – analysis in time and frequency domain, EMTP for transient computation.

UNIT V INSULATION COORDINATION 12

Insulation co-ordination – over voltage protective devices principles of recent co-ordination and design of EHV lines. **Total = 60**

COURSE OUTCOMES

- Ability to understand and analyze power system transients and types of switching transients.
- To get knowledge about lightning transients and high voltage transient behavior travelling on line.
- To get knowledge about transients in integrated power systems.

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter science, New York, 2nd edition 1991.
2. R.D Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCES

1. Klaus Ragaller, 'Surges in High Voltage Networks', Plenum Press, New York, 1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

19153E74BP -EHV AC and DC TRANSMISSION SYSTEMS

3 0 0 3

UNIT I	TRANSMISSION ENGINEERING	9
Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.		
UNIT II	LINE PARAMETER	9
Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.		
UNIT III	POWER CONTROL	9
Power frequency and voltage control – voltage control – Over voltages – Power circle diagram – Voltage control using shunt and series compensation – Static VAR compensation – Higher Phase order system – FACTS.		
UNIT IV	EHV AC Transmission	9
Design of EHV lines based in steady state limits and transient over voltages – Design of extra HV cable transmission – XLPE cables – Gas insulated cable – Corona and RIV.		
UNIT V	HVDC TRANSMISSION	9
HVDC Transmission principles – Comparison of HVAC and HVDC transmission – Economics – types of Converters – HVDC links – HVDC control – Harmonics – Filters – Multi terminal DC System – HVDC cables and HVDC circuit breakers.		
		Total=45

COURSE OUTCOMES

- Basic knowledge of HVDC Transmission, its components, types and applications
- Ability to analyze and design the Converter circuits, System Control Techniques
- Ability to design filters for harmonic control and perform power flow analysis using Per unit system for DC Quantities.

Reference Books:

1. Rakosh Das Begamudre, 'Extra HVDC Transmission Engineering', Wiley Eastern Ltd, 1990.
2. Padiyar K.R., 'HVDC Power Transmission systems', Wiley Eastern Ltd, 1993.
3. Allan Greenwood, 'Electrical transients in power Systems', John Eastern Ltd, New York, 1992.
4. Arrilaga J., 'HVDC transmission', Peter Perengrinus Ltd, London, 1983.

19153E74CP - FIBRE OPTICS AND LASER INSTRUMENTS

3 0 0

3

AIM:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial & Medical Application.

OBJECTIVES

- i. To expose the students to the basic concepts of optical fibres and their properties.
- ii. To provide adequate knowledge about the Industrial applications of optical fibres.
- iii. To expose the students to the Laser fundamentals.
- iv. To provide adequate knowledge about Industrial application of lasers.
- v. To provide adequate knowledge about holography & Medical applications of Lasers.

1. OPTICAL FIBRES AND THEIR PROPERTIES 12

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors & splicers – Fibre termination – Optical sources – Optical detectors.

2. INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

3. LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

4. INDUSTRIAL APPLICATION OF LASERS 6

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

5. HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography – Basic principle - Methods – Helographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumours of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

L= 45 Total = 45

COURSE OUTCOMES

- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to know the basic properties of laser and to apply for industry.
- Recognize the importance of laser in medicinal and industry applications.

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Donald J. Sterling Jr, 'Technicians Guide to Fibre Optics', 3rd Edition, Vikas Publishing House, 2000.
 2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
 3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
 4. Monte Ross, 'Laser Applications', McGraw Hill, 1968
 5. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
 6. Mr. Gupta, 'Fiber Optics Communication', Prentice Hall of India, 2004.
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19153E74DP - ADVANCED CONTROL SYSTEMS**3 0 0 3****AIM**

To gain knowledge in analysis of non-linear system and digital control of linear system.

OBJECTIVES

- i. To study the description and stability of non-linear system.
- ii. To study the conventional technique of non-linear system analysis.
- iii. To study the analysis discrete time systems using conventional techniques.
- iv. To study the analysis of digital control system using state-space formulation.
- v. To study the formulation and analysis of multi input multi output (MIMO) system.

UNIT I NON-LINEAR SYSTEM – DESCRIPTION & STABILITY**9**

Linear vs non-linear – Examples – Incidental and Intentional – Mathematical description - Equilibria and linearisation - Stability – Lyapunov function – Construction of Lyapunov function.

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS**9**

Construction of phase trajectory – Isocline method – Direct or numerical integration – Describing function definition – Computation of amplitude and frequency of oscillation.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM**9**

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT IV STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM**9**

State equation – Solutions – Realization – Controllability – Observability – Stability Jury's test.

UNIT V MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:**9**

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control. **L = 45 Total = 45**

COURSE OUTCOMES

- Develop mathematical models and understand the mathematical relationships between
- the sensitivity functions and how they govern the fundamentals in control systems.
- Design and fine tune PID controllers and understand the roles of P, I and D in feedback control and develop state-space models
- Advanced filters design for various control applications with proper error estimation techniques.

TEXT BOOKS

1. Benjamin C. Kuo, 'Digital Control Systems', Oxford University Press, 1992.
2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

REFERENCE BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Raymond T. Stefani & Co., 'Design of feed back Control systems', Oxford University, 2002.
3. William L. Luyben and Michael L. Luyben, 'Essentials of Process Control', McGraw Hill International Editions, Chemical Engineering Series, 1997.

19153E74EP SWITCHED MODE POWER SUPPLIES 2 0 2 4

AIM

To study low power SMPS and UPS technologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I Introduction 9

Linear regulator Vs. Switching regulator – Topologies of SMPS – isolated and non isolated topologies – Buck – Boost – Buck boost – Cuk – Polarity inverting topologies – Push pull and forward converters half bridge and full bridge – Fly back converters Voltage fed and current fed topologies. EMI issues.

UNIT-II Design Concepts 9

Magnetic Circuits and design – Transformer design - core selection – winding wire selection – temperature rise calculations - Inductor design. Core loss – copper loss – skin effect - proximity effect. Power semiconductor selection and its drive circuit design – snubber circuits. Closing the feedback loop – Control design – stability considerations

UNIT-III Control Modes 9

Voltage Mode Control of SMPS.. Transfer Function and Frequency response of Error Amp. Transconductance Error Amps. PWM Control ICs (SG 3525, TL 494, MC34060 etc.) Current Mode Control and its advantages. Current Mode Vs Voltage Mode. Current Mode PWM Control IC(eg. UC3842).

UNIT-IV Applications of SMPS 9

Active front end – power factor correction – High frequency power source for fluorescent lamps - power supplies for portable electronic gadgets.

UNIT-V Resonant converters 9

Principle of operation – modes of operation – quasi resonant operation- advantages.

Total : 45

Text/Reference Books:

1. Abraham I Pressman - Switching power supply design – 2nd edition 1998 Mc-Graw hill Publishing Company.
2. Keith H Billings - Switch mode power supply handbook – 1st edition 1989 Mc-Graw hill Publishing Company.
3. Sanjaya Maniktala - Switching power supplies A to Z. – 1st edition 2006, Elsevier Inc.
4. Daniel M Mitchell : DC-DC Switching Regulator Analysis. McGraw Hill Publishing Company
5. Ned Mohan et.al : Power Electronics. John Wiley and Sons.
6. Otmar Kilgenstein : Switched Mode Power Supplies in Practice. John Wiley and Sons.

7. Mark J Nave : Power Line Filter Design for Switched-Mode Power Supplies. Van Nostrand Reinhold, New York.

19153P75P Project Work

- The student will use their ability to design electrical, electronic systems and signals through modeling, simulation, experimentation, interpretation and analysis to build, test, and debug prototype circuits and systems and analyze results using the principles of design to solve open-ended engineering problems.
- The students will be able to take professional decisions based on the impact of socio-economic issues by their self-confidence, a high degree of personal integrity, and the belief that they can each make a difference by developing persuasive communication skills in a variety of media by engaging them in team-based activities, and by strengthening their interpersonal skills. This will lead to develop the leadership qualities by making the students to identify their personal values and demonstrate the practice of ethical leadership.
- The students will be able to appreciate the importance of optimization, commercialization, and innovation as the desired features of the designed system



PRIST
DEEMED UNIVERSITY
VALLAM, THANJAVUR.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF EEE

M.TECH-POWER SYSTEMS (FULL TIME)

COURSE STRUCTURE -R2019

PRIST
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
M.TECH - POWER ELECTRONICS AND DRIVES (FULL TIME)
CURRICULUM – REGULATION 2019
SEMESTER – I

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19248S11D	Applied Mathematics For Electrical & Electronics Engineering	3	1	0	4
2.	19253C12	Advanced Power Semiconductor Devices And Their Applications	3	1	0	4
3.	19253C13	Analysis of Power Converters	3	1	0	4
4.	19253C14	Analysis of Inverters	3	1	0	4
5.	19253C15	Modeling And Analysis Of Electrical Machines	3	1	0	4
6.	19253E16_	Elective-I	3	0	0	3
7.	19253L17	Power Electronics Lab-I	0	0	3	3
Research Skill Development (RSD) Course						
8.	19253CRS	Research Led Seminar				1
TOTAL						27

SEMESTER – II

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253C21	Solid State Dc Drives	3	1	0	4
2.	19253C22	Solid State Ac Drives	3	1	0	4
3.	19253C23	Microprocessor and microcontroller applications in power electronics	3	1	0	4
4.	19253E24_	Elective -II	3	0	0	3
5.	19253E25_	Elective -III	3	0	0	3
6.	19253L26	Power Electronics Lab-II	0	0	3	3
7.	192TECWR	Technical Writing/Seminar	0	0	3	3
Research Skill Development (RSD) Course						
8.	19253CRM	Research Methodology	3	0	0	3
9.	19253CBR	Participation in Bounded Research	2	0	0	2
TOTAL						29

SEMESTER – III

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253C31	Embedded Control Of Electrical Drives	3	1	0	4
2.	19253E32_	Elective –IV	3	0	0	3
3.	19253E33_	Elective –V	3	0	0	3
4.	19253E34_	Elective –VI	3	0	0	3
5.	19253P35	Project work Phase- I	0	0	10	10
Research Skill Development (RSD) Course						
6.	19253CSR	Design / Socio Technical Project	0	0	6	6
TOTAL						29

SEMESTER – IV

S.NO.	COURSE CODE	SUBJECT	L	T	P	C
1.	19253P41	Project work Phase - II	0	0	15	15
TOTAL						15

TOTAL CREDITS: 100

ELECTIVE –I

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E16A	System Theory	3	0	0	3
2.	19253E16B	High Voltage Direct Current Transmission System	3	0	0	3
3.	19253E16C	Advanced Power System Dynamics	3	0	0	3
4.	19253E16D	Design of Substations	3	0	0	3

ELECTIVE –II

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E24A	Flexible Ac Transmission System	3	0	0	3
2.	19253E24B	Power Conditioning	3	0	0	3
3.	19253E24C	Power System Reliability	3	0	0	3
4.	19253E24D	Distributed Generation and Microgrid	3	0	0	3

ELECTIVE -III

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E25A	Wind Energy Conversion Systems	3	0	0	3
2.	19253E25B	Computer Aided Design Of Electrical Machines	3	0	0	3
3.	19253E25C	Electrical Distribution System	3	0	0	3
4.	19253E25D	Energy Management and Auditing	3	0	0	3

ELECTIVE -IV

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E32A	Power Electronics Applications In Power Systems	3	0	0	3
2.	19253E32B	POWER SYSTEM DYNAMICS	3	0	0	3
3.	19253E32C	Electric Vehicles and Power Management	3	0	0	3
4.	19253E32D	Electromagnetic Interference and Compatibility	3	0	0	3

ELECTIVE -V

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E33A	Special machines and controllers	3	0	0	3
2.	19253E33B	Object oriented programming and its applications to electrical engineering	3	0	0	3
3.	19253E33C	Control System Design for Power Electronics	3	0	0	3
4.	19253E33D	Advanced Digital Signal Processing	3	0	0	3

ELECTIVE -VI

S.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19253E34A	Software for control system design	3	0	0	3
2.	19253E34B	Computer aided design of power electronic circuits	3	0	0	3
3.	19253E34C	Soft Computing Techniques	3	0	0	3
4.	19253E34D	Restructured Power System	3	0	0	3

Credit Distribution

Sem.	Core Courses						Elective Courses		Foundation Courses		Total Credits
	Theory Courses		Practical Courses		Courses on *RSD						
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	04	16	01	03	01	01	01	03	01	04	27
II	03	12	02	06	02	05	02	06	-	-	29
III	01	04	-	-	02	16	03	09	-	-	29
IV	-	-	-	-	01	15	-	-	-	-	15
Total Credits											100

*RSD-Research Skill Development

HOD

DEAN E&T

DEAN ACADEMICS

VICE CHANCELLOR

SYLLABUS

**19248S11D - APPLIED MATHEMATICS FOR ELECTRICAL & ELECTRONICS
ENGINEERING**

3 1 0 4

1. ADVANCED MATRIX THEORY 9

Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.

2. RANDOM PROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .

3. LINEAR PROGRAMMING 9

Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.

4. DYNAMIC PROGRAMMING 9

Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS 9

Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of $J_n(p) = 0$, Transform of

$$\frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx}, \text{ and Transform of } \frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx} - \frac{n^2f}{x^2}$$

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).
5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT 9

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS 9

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS 9

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS 9

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY 9

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

19272H13 - POWER SYSTEM MODELLING AND ANALYSIS**3 1 0 4****1. SOLUTION TECHNIQUE****9**

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS**9**

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW**9**

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS**9**

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS**9**

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES:

1. G W Stagg, A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol: AC-18, pp: 333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization: Basic Computational Algorithm and Programming Techniques; pp: 75-96; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd, Academic Press, 1971.

19272H14 - ECONOMIC OPERATIONS OF POWER SYSTEMS-I**3 1 0 4****1. INTRODUCTION****9**

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM**9**

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal sitting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING**9**

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT**9**

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING**9**

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, "Economic control of Interconnected systems", Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

19253E16B - HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM**3 1 0 4****1. DC POWER TRANSMISSION TECHNOLOGY 9**

Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.

2. ANALYSIS OF HVDC CONVERTERS 9

Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.

3. CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.

4. HARMONICS AND FILTERS 9

Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.

5. SIMULATION OF HVDC SYSTEMS 9

Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

19272H21 - EHV POWER TRANSMISSION

3 1 0 4

1. INTRODUCTION

9

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS

9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS

9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS

9

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES

9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

19272H22 - ECONOMIC OPERATIONS OF POWER SYSTEMS-II**3 1 0 4****1. AUTOMATIC GENERATION CONTROL****9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL**9**

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT**9**

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION**9**

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system-computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM**9**

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Kundur.P., "power system stability and control", McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A., "power system control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "power systems voltage stability", McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, "voltage stability of power system", Kluwer Academic Publishers, 1998.
7. Elgerd O.L., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

19272H23 - POWER SYSTEM PROTECTION

3 1 0 4

1. INTRODUCTION 9

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION 9

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION 9

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING 9

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING 9

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Arun k. Phadke, James.S.Thorp, “ Computer relaying for power system”, John Wiley and sons, New York, 1988.
2. Jones D., “Analysis and protection of electrical power systems”, Pitman Publishing, 1971.
3. “Power system references manual, Ray rolls protection”, Orient press, 1982.
4. Stanly H., Horowitz (ED), “Protective relaying for power system”, IEEE press, 1980.
5. Kundur P., “power system stability and control”, McGraw Hill, 1994.

LIST OF EXPERIMENTS:

1. Small signal stability analysis: SMIB and Multi machine configuration.
2. Transients stability analysis of Multi – machine configuration.
3. Load Frequency control: single area, multi area control.
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

19272H31 - ELECTRICAL TRANSIENTS IN POWER SYSTEMS**3 1 0 4****1. TRAVELLING WAVES ON TRANSMISSION LINE 9**

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level – overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

19272E16A – ANALYSIS AND DESIGN OF POWER CONVERTERS L T P C**3 0 0 3****OBJECTIVES:**

- To determine the operation and characteristics of controlled rectifiers.
- To apply switching techniques and basic topologies of DC-DC switching regulators.
- To introduce the design of power converter components.
- To provide an in depth knowledge about resonant converters.
- To comprehend the concepts of AC-AC power converters and their applications.

UNIT I SINGLE PHASE & THREE PHASE CONVERTERS 9

Principle of phase controlled converter operation – single-phase full converter and semi-converter (RL, RLE load)- single phase dual converter – Three phase operation full converter and semi-converter (R, RL, RLE load) – reactive power – power factor improvement techniques – PWM rectifiers.

UNIT II DC-DC CONVERTERS 9

Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk & SEPIC – under continuous and discontinuous operation – Isolated converters: basic operation of Flyback, Forward and Push-pull topologies.

UNIT III DESIGN OF POWER CONVERTER COMPONENTS 9

Introduction to magnetic materials- hard and soft magnetic materials – types of cores, copper windings – Design of transformer – Inductor design equations – Examples of inductor design for buck/flyback converter – selection of output filter capacitors – selection of ratings for devices – input filter design.

UNIT IV RESONANT DC-DC CONVERTERS 9

Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters- load resonant converters – series and parallel – resonant switch converters – operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS-Introduction to ZVT/ZCT PWM converters.

UNIT V AC-AC CONVERTERS 9

Principle of on-off and phase angle control – single phase ac voltage controller – analysis with R & RL load – Three phase ac voltage controller – principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

TOTAL : 45 PERIODS**OUTCOMES:**

At the end of the course the student will be able to:

- Analyze various single phase and three phase power converters
- Select and design dc-dc converter topologies for a broad range of power conversion applications.
- Develop improved power converters for any stringent application requirements.
- Design ac-ac converters for variable frequency applications.

TEXT BOOKS:

- 1 Ned Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: converters, Application and design" John Wiley and sons. Wiley India edition, 2006.
- 2 Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.
- 3 P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.
- 4 P.S. Bimbhra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003
- 5 Simon Ang, Alejandro Oliva, "Power-Switching Converters, Second Edition, CRC Press, Taylor & Francis Group, 2010
- 6 V. Ramanarayanan, "Course material on Switched mode power conversion", 2007
- 7 Alex Van den Bossche and Vencislav Cekov Valchev, "Inductors and Transformers for Power Electronics", CRC Press, Taylor & Francis Group, 2005
- 8 W. G. Hurley and W. H. Wolfe, "Transformers and Inductors for Power Electronics Theory, Design and Applications", 2013 John Wiley & Sons Ltd.
- 9 Marian. K. Kazimierczuk and Dariusz Czarkowski, "Resonant Power Converters", John Wiley & Sons limited, 2011

19272E16B - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES**3 1 0 4****UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION**

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

OBJECTIVES:

- To perform transient stability analysis using unified algorithm.
- To impart knowledge on sub-synchronous resonance and oscillations
- To analyze voltage stability problem in power system.
- To familiarize the methods of transient stability enhancement

UNIT I TRANSIENT STABILITY ANALYSIS**9**

Review of numerical integration methods: Euler and Fourth Order Runge-Kutta methods, Numerical stability and implicit methods, Interfacing of Synchronous machine (variable voltage) model to the transient stability algorithm (TSA) with partitioned – explicit and implicit approaches – Interfacing SVC with TSA-methods to enhance transient stability

UNIT II UNIFIED ALGORITHM FOR DYNAMIC ANALYSIS OF POWER SYSTEMS**9**

Need for unified algorithm- numerical integration algorithmic steps-truncation error-variable step size – handling the discontinuities- numerical stability- application of the algorithm for transient. Mid-term and long-term stability simulations

UNIT III SUBSYNCHRONOUS RESONANCE (SSR) AND OSCILLATIONS**9**

Subsynchronous Resonance (SSR) – Types of SSR - Characteristics of series –Compensated transmission systems –Modeling of turbine-generator-transmission network- Self-excitation due to induction generator effect – Torsional interaction resulting in SSR – Methods of analyzing SSR – Numerical examples illustrating instability of subsynchronous oscillations – time-domain simulation of subsynchronous resonance – EMTD with detailed synchronous machine model- Turbine Generator Torsional Characteristics: Shaft system model – Examples of torsional characteristics – Torsional Interaction with Power System Controls: Interaction with generator excitation controls – Interaction with speed governors – Interaction with nearby DC converters

UNIT IV TRANSMISSION, GENERATION AND LOAD ASPECTS OF VOLTAGE STABILITY ANALYSIS**9**

Review of transmission aspects – Generation Aspects: Review of synchronous machine theory – Voltage and frequency controllers – Limiting devices affecting voltage stability – Voltage-reactive power characteristics of synchronous generators – Capability curves – Effect of machine limitation on deliverable power – Load Aspects – Voltage dependence of loads – Load restoration dynamics – Induction motors – Load tap changers – Thermostatic load recovery – General aggregate load models.

UNIT V ENHANCEMENT OF TRANSIENT STABILITY AND COUNTER MEASURES FOR SUB SYNCHRONOUS RESONANCE**9**

Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving, high-speed excitation systems; NGH damper scheme.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- Learners will have knowledge on Over current protection.
- Learners will attain knowledge about Distance and Carrier protection in transmission lines.
- Learners will understand the concepts of Busbar protection.
- Learners will attain basic knowledge on numerical protection techniques

REFERENCES

- 1 R.Ramnujam," Power System Dynamics Analysis and Simulation", PHI Learning Private Limited, New Delhi, 2009
- 2 T.V. Cutsem and C.Vournas, "Voltage Stability of Electric Power Systems", Kluwer publishers,1998
- 3 P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
- 4 H.W. Dommel and N.Sato, "Fast Transient Stability Solutions," IEEE Trans., Vol. PAS-91, pp, 1643-1650, July/August 1972.
- 5 Roderick J . Frowd and J. C. Giri, "Transient stability and Long term dynamics unified", IEEE Trans., Vol 101, No. 10, October 1982.
- 6 M.Stubbe, A.Bihain,J.Deuse, J.C.Baader, "A New Unified software program for the study of the dynamic behaviour of electrical power system" IEEE Transaction, Power Systems, Vol.4.No.1,Feb:1989 Pg.129 to 138

- To provide in-depth knowledge on design criteria of Air Insulated Substation (AIS) and Gas Insulated Substation (GIS).
- To study the substation insulation co-ordination and protection scheme.
- To study the source and effect of fast transients in AIS and GIS.

UNIT I INTRODUCTION TO AIS AND GIS 9

Introduction – characteristics – comparison of Air Insulated Substation (AIS) and Gas Insulated Substation (GIS) – main features of substations, Environmental considerations, Planning and installation- GIB / GIL

UNIT II MAJOR EQUIPMENT AND LAYOUT OF AIS AND GIS 9

Major equipment – design features – equipment specification, types of electrical stresses, mechanical aspects of substation design- substation switching schemes- single feeder circuits; single or main bus and sectionalized single bus- double main bus-main and transfer bus- main, reserve and transfer bus- breaker-and-a- half scheme-ring bus

UNIT III INSULATION COORDINATION OF AIS AND GIS 9

Introduction – stress at the equipment – insulation strength and its selection – standard BILs – Application of simplified method – Comparison with IEEE and IEC guides.

UNIT IV GROUNDING AND SHIELDING 9

Definitions – soil resistivity measurement – ground fault currents – ground conductor – design of substation grounding system – shielding of substations – Shielding by wires and masts.

UNIT V FAST TRANSIENTS PHENOMENON IN AIS AND GIS 9

Introduction – Disconnecter switching in relation to very fast transients – origin of VFTO – propagation and mechanism of VFTO – VFTO characteristics – Effects of VFTO.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to apply Awareness towards substation equipment and their arrangements.
- Ability to design the substation for present requirement with proper insulation coordination and protection against fast transients.

REFERENCES

- 1 Andrew R. Hileman, “Insulation coordination for power systems”, Taylor and Francis, 1999.
- 2 M.S. Naidu, “Gas Insulation Substations”, I.K. International Publishing House Private Limited, 2008.
- 3 Klaus Ragallar, “Surges in high voltage networks” Plenum Press, New York, 1980.
- 4 “Power Engineer’s handbook”, TNEB Association.

- 5 Pritindra Chowdhuri, "Electromagnetic transients in power systems", PHI Learning Private Limited, New Delhi, Second edition, 2004.
- 6 "Design guide for rural substation", United States Department of Agriculture, RUS Bulletin, 1724E-300, June 2001.
- 7 AIEE Committee Report, "Substation One-line Diagrams," AIEE Trans. On Power Apparatus and Systems, August 1953.
- 8 Hermann Koch, "Gas Insulated Substations", Wiley-IEEE Press, 2014.

19272E24A

SMART GRID

LTPC

3003

OBJECTIVES:

- ☐ To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- ☐ To familiarize the power quality management issues in Smart Grid.
- ☐ To familiarize the high performance computing for Smart Grid applications

UNIT I INTRODUCTION TO SMART GRID**9**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES**9**

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE**9**

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID**9**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

APPLICATIONS

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will develop more understanding on the concepts of Smart Grid and its present developments.
- Learners will study about different Smart Grid technologies.
- Learners will acquire knowledge about different smart meters and advanced metering infrastructure.
- Learners will have knowledge on power quality management in Smart Grids
- Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid application

REFERENCES

- 1 Stuart Borlase “Smart Grid :Infrastructure, Technology and Solutions”, CRC Press 2012.
- 2 Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley 2012.
- 3 Vehbi C. Güngör, DilanSahin, TaskinKocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication Technologies and Standards” IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.
- 4 Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids, vol. 14, 2012.

OBJECTIVES:

- To Study about solar modules and PV system design and their applications
- To Deal with grid connected PV systems
- To Discuss about different energy storage systems

UNIT I INTRODUCTION**9**

Characteristics of sunlight – semiconductors and P-N junctions – behavior of solar cells – cell properties – PV cell interconnection

UNIT II STAND ALONE PV SYSTEM**9**

Solar modules – storage systems – power conditioning and regulation - MPPT- protection – stand alone PV systems design – sizing

UNIT III GRID CONNECTED PV SYSTEMS**9**

PV systems in buildings – design issues for central power stations – safety – Economic aspect – Efficiency and performance - International PV programs

UNIT IV ENERGY STORAGE SYSTEMS**9**

Impact of intermittent generation – Battery energy storage – solar thermal energy storage – pumped hydroelectric energy storage

UNIT V APPLICATIONS**9**

Water pumping – battery chargers – solar car – direct-drive applications –Space – Telecommunications.

TOTAL : 45 PERIODS**OUTCOMES:**

- Students will develop more understanding on solar energy storage systems
- Students will develop basic knowledge on standalone PV system
- Students will understand the issues in grid connected PV systems
- Students will study about the modeling of different energy storage systems and their performances
- Students will attain more on different applications of solar energy

REFERENCES

- 1 Solanki C.S., “Solar Photovoltaics: Fundamentals, Technologies And Applications”, PHI Learning Pvt. Ltd.,2015.
- 2 Stuart R.Wenham, Martin A.Green, Muriel E. Watt and Richard Corkish, “Applied Photovoltaics”, 2007,Earthscan, UK. Eduardo Lorenzo G. Araujo, “Solar electricity engineering of photovoltaic systems”, Progensa,1994.

- 3 Frank S. Barnes & Jonah G. Levine, "Large Energy storage Systems Handbook", CRC Press, 2011.
- 4 McNeils, Frenkel, Desai, "Solar & Wind Energy Technologies", Wiley Eastern, 1990
- 5 S.P. Sukhatme , "Solar Energy", Tata McGraw Hill,1987.

19272E24C

POWER SYSTEM RELIABILITY

L T P C

OBJECTIVES:

3 0 0 3

- To introduces the objectives of Load forecasting.
- To study the fundamentals of Generation system, transmission system and Distribution system reliability analysis
- To illustrate the basic concepts of Expansion planning

UNIT I

LOAD FORECASTING

9

Objectives of forecasting - Load growth patterns and their importance in planning - Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

UNIT II

GENERATION SYSTEM RELIABILITY ANALYSIS

9

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of ISO and interconnected generation systems

UNIT III

TRANSMISSION SYSTEM RELIABILITY ANALYSIS

9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served

UNIT IV

EXPANSION PLANNING

9

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

UNIT V

DISTRIBUTION SYSTEM PLANNING OVERVIEW

9

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will develop the ability to learn about load forecasting.
- Students will learn about reliability analysis of ISO and interconnected systems.
- Students will understand the concepts of Contingency analysis and Probabilistic Load flow Analysis
- Students will be able to understand the concepts of Expansion planning
- Students will have knowledge on the fundamental concepts of the Distribution system planning

REFERENCES

- 1 Roy Billinton & Ronald N. Allan, "Reliability Evaluation of Power Systems" Springer Publication,
- 2 R.L. Sullivan, "Power System Planning", Tata McGraw Hill Publishing Company Ltd 1977.
- 3 X. Wang & J.R. McDonald, "Modern Power System Planning", McGraw Hill Book Company 1994.
- 4 T. Gonen, "Electrical Power Distribution Engineering", McGraw Hill Book Company 1986.
- 5 B.R. Gupta, "Generation of Electrical Energy", S.Chand Publications 1983.

OBJECTIVES:

- To illustrate the concept of distributed generation
- To analyze the impact of grid integration.
- To study concept of Microgrid and its configuration

UNIT I INTRODUCTION 9

Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II DISTRIBUTED GENERATIONS (DG) 9

Concept of distributed generations, topologies, selection of sources, regulatory standards/framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

UNIT III IMPACT OF GRID INTEGRATION 9

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV BASICS OF A MICROGRID 9

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids

UNIT V CONTROL AND OPERATION OF MICROGRID 9

Modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.

TOTAL : 45 PERIODS**OUTCOMES:**

- Learners will attain knowledge on the various schemes of conventional and nonconventional power generation.

- Learners will have knowledge on the topologies and energy sources of distributed generation.
- Learners will learn about the requirements for grid interconnection and its impact with NCE sources
- Learners will understand the fundamental concept of Microgrid.

REFERENCES

- 1 Amirnaser Yezdani, and Reza Iravani, “Voltage Source Converters in Power Systems: Modeling, Control and Applications”, IEEE John Wiley Publications, 2010.
- 2 Dorin Neacsu, “Power Switching Converters: Medium and High Power”, CRC Press, Taylor & Francis, 2006
- 3 Chetan Singh Solanki, “Solar Photo Voltaics”, PHI learning Pvt. Ltd., New Delhi, 2009
- 4 J.F. Manwell, J.G. McGowan “Wind Energy Explained, theory design and applications”, Wiley publication 2010.
- 5 D. D. Hall and R. P. Grover, “Biomass Regenerable Energy”, John Wiley, New York, 1987.
- 6 John Twidell and Tony Weir, “Renewable Energy Resources” Tylor and Francis Publications, Second edition 2006.

19272E25A - WIND ENERGY CONVERSION SYSTEMS**3 1 0 4****UNIT-I INTRODUCTION:****9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER**GENERATION:****9**

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS:**9**

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments- anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND**CONTROL ASPECTS:****9**

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanent magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY**9**

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C = 4**REFERENCES:**

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin & co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power from the wind", Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

19272E25B - AI TECHNIQUES TO POWER SYSTEMS**3 1 0 4****1. INTRODUCTION TO NEURAL NETWORKS****9**

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS**9**

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC**9**

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS**9**

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS**9**

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques”, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, 1993.
3. Zimmerman.H.J,„Fuzzy Set Theory and its Applications”, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems”, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering”, John Wiley & SonsLtd.,1998.

OBJECTIVES:**3 0 0 3**

- To provide knowledge about the distribution system electrical characteristics
- To gain knowledge about planning and designing of distribution system
- To analyze power quality in distribution system
- To analyze the power flow in balanced and unbalanced system

UNIT I**INTRODUCTION****9**

Distribution System-Distribution Feeder Electrical Characteristics-Nature of Loads : Individual Customer Load, Distribution Transformer Loading and Feeder Load -Approximate Method of Analysis: Voltage Drop, Line Impedance, "K" Factors, Uniformly Distributed Loads and Lumping Loads in Geometric Configurations.

UNIT II**DISTRIBUTION SYSTEM PLANNING****9**

Factors effecting planning, present techniques, planning models(Short term planning, long term planning and dynamic planning), planning in the future, future nature of distribution planning, Role of computer in Distribution planning. Load forecast, Load characteristics and Load models.

UNIT III**DISTRIBUTION SYSTEM LINE MODEL****9**

Exact Line Segment Model-Modified Line Model- Approximate Line Segment Model-Modified "Ladder" Iterative Technique-General Matrices for Parallel Lines.

UNIT IV**VOLTAGE REGULATION****9**

Standard Voltage Ratings-Two-Winding Transformer Theory-Two-Winding Autotransformer-Step-Voltage Regulators: Single-Phase Step-Voltage Regulators-Three-Phase Step-Voltage Regulators- Application of capacitors in Distribution system.

UNIT V**DISTRIBUTION FEEDER ANALYSIS****9**

Power-Flow Analysis- Ladder Iterative Technique -Unbalanced Three-Phase Distribution Feeder- Modified Ladder Iterative Technique- Load Allocation- Short-Circuit Studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- Ability to apply the concepts of planning and design of distribution system for utility systems
- Ability to implement the concepts of volatage control in distribution system.
- Ability to analyze the power flow in balanced and unbalanced system

REFERENCES

1. William H. Kersting," Distribution System Modeling and Analysis " CRC press 3rd edition,2012.

2. Turan Gonen, "Electric Power Distribution System Engineering", McGraw Hill Company. 1986
3. James Northcote – Green, Robert Wilson, "Control and Automation of Electrical Power Distribution Systems", CRC Press, New York, 2007.
4. Pabla H S, "Electrical Power Distribution Systems", Tata McGraw Hill. 2004

19272E25D ENERGY MANAGEMENT AND AUDITING L T P C

OBJECTIVES:

3 0 0 3

- To study the concepts behind economic analysis and Load management.
- To emphasize the energy management on various electrical equipments and metering.
- To illustrate the concept of lighting systems and cogeneration.

UNIT I INTRODUCTION 9

Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNIT II ENERGY COST AND LOAD MANAGEMENT 9

Important concepts in an economic analysis - Economic models-Time value of money-Utility rate structures- cost of electricity-Loss evaluation- Load management: Demand control techniques-Utility monitoring and control system-HVAC and energy management-Economic justification.

UNIT III ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT 9

Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines.

UNIT IV METERING FOR ENERGY MANAGEMENT 9

Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples.

UNIT V LIGHTING SYSTEMS & COGENERATION 9

Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TOTAL : 45 PERIODS

OUTCOMES:

- Students will develop the ability to learn about the need for energy management and auditing process
- Learners will learn about basic concepts of economic analysis and load management.
- Students will understand the energy management on various electrical equipments.
- Students will have knowledge on the concepts of metering and factors influencing cost function

- Students will be able to learn about the concept of lighting systems, light sources and various forms of cogeneration

REFERENCES

- 1 Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, "Guide to Energy Management", Fifth Edition, The Fairmont Press, Inc., 2006
- 2 Eastop T.D & Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, 1990.
- 3 Reay D.A, "Industrial Energy Conservation", 1st edition, Pergamon Press, 1977.
- 4 "IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities", IEEE, 1996
- 5 Amit K. Tyagi, "Handbook on Energy Audits and Management", TERI, 2003.

19272E32A - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS**3 1 0 4****UNIT: I STATIC COMPENSATOR CONTROL****9**

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) -Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT **9**

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS **9**

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL **9**

Solid state excitation of synchronous generators - Different schemes - Genex excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM **9**

Parallel, Redundant and non-redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C =4**TEXT BOOK**

Miller. T.J.E, "Reactive power control in Electric systems". Wiley inter science, New York, 1982.

REFERENCES

1. "Static Compensator for AC power systems", Proc. IEE vol.128 Nov. 1981. pp 362-406.
2. "A Static alternative to the transformer on load tap changing", IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "Improvements in Thyristor controlled static on- load tap controllers for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Genex Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

1. SYNCHRONOUS MACHINE MODELLING**9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS**9**

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS**9**

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS**9**

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

OBJECTIVES:

- To understand the concept of electrical vehicles and its operations
- To understand the need for energy storage in hybrid vehicles
- To provide knowledge about various possible energy storage technologies that can be used in electric vehicles

UNIT I ELECTRIC VEHICLES AND VEHICLE MECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics

UNIT II ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS 9

Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV)- Power train components and sizing, Gears, Clutches, Transmission and Brakes

UNIT III CONTROL OF DC AND AC DRIVES 9

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor based vector control operation – Switched reluctance motor (SRM) drives

UNIT IV BATTERY ENERGY STORAGE SYSTEM 9

Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries

UNIT V ALTERNATIVE ENERGY STORAGE SYSTEMS 9

Fuel cell – Characteristics- Types – hydrogen Storage Systems and Fuel cell EV – Ultra capacitors

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will understand the operation of Electric vehicles and various energy storage technologies for electrical vehicles

REFERENCES

- 1 Iqbal Hussain, “**Electric and Hybrid Vehicles: Design Fundamentals, Second Edition**” CRC Press, Taylor & Francis Group, Second Edition (2011).
- 2 Ali Emadi, Mehrdad Ehsani, John M.Miller, “**Vehicular Electric Power Systems**”, Special Indian Edition, Marcel dekker, Inc 2010.

OBJECTIVES:

- To provide fundamental knowledge on electromagnetic interference and electromagnetic compatibility.
- To study the important techniques to control EMI and EMC.
- To expose the knowledge on testing techniques as per Indian and international standards in EMI measurement.

UNIT I INTRODUCTION**9**

Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation typical noise path- EMI predictions and modeling, Cross talk - Methods of eliminating interferences.

UNIT II GROUNDING AND CABLING**9**

Cabling- types of cables, mechanism of EMI emission / coupling in cables -capacitive coupling inductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding - safety grounds - signal grounds- single point and multipoint ground systems hybrid grounds- functional ground layout -grounding of cable shields- -guard shields- isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding- Earth measurement Methods

UNIT III BALANCING, FILTERING AND SHIELDING**9**

Power supply decoupling- decoupling filters-amplifier filtering -high frequency filtering- EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding - near and far fields shielding effectiveness - absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings - grounding of shields

UNIT IV EMI IN ELEMENTS AND CIRCUITS**9**

Electromagnetic emissions, noise from relays and switches, non- linearities in circuits, passive inter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

UNIT V ELECTROSTATIC DISCHARGE, STANDARDS AND TESTING TECHNIQUES**9**

Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipment's- standards - FCC requirements - EMI measurements - Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

TOTAL: 45 PERIODS**OUTCOMES:**

- Recognize the sources of Conducted and radiated EMI in Power Electronic Converters and consumer appliances and suggest remedial measures to mitigate the problems
- Assess the insertion loss and design EMI filters to reduce the loss
- Design EMI filters, common-mode chokes and RC-snubber circuits measures to keep the interference within tolerable limits

REFERENCES

1. V.P. Kodali, "Engineering Electromagnetic Compatibility", S. Chand, 1996
2. Henry W.Ott, " Noise reduction techniques in electronic systems", John Wiley & Sons, 1989
3. Bernhard Keiser, "Principles of Electro-magnetic Compatibility", Artech House, Inc. (685 canton street, Norwood, MA 020062 USA) 1987
4. Bridges, J.E Milleta J. and Ricketts.L.W., "EMP Radiation and Protective techniques", John Wiley and sons, USA 1976
5. William Duff G., & Donald White R. J, "Series on Electromagnetic Interference and Compatibility", Vol.
6. Weston David A., "Electromagnetic Compatibility, Principles and Applications", 1991.

ELECTIVES – V (semester-III)**19272E33A - POWER CONDITIONING****3 1 0 4****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace’ s, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On–line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)
3. Dugan.R.C, “ Electrical Power System Quality”,TMH,2008.
- 4.Arrillga.A.J and Neville R.Watson, Power System Harmonics, John Wiley second Edition,2003.
5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.

ELECTIVES – V (semester-III)**19272E33B – POWER SYSTEM RESTRUCTURING AND DEREGULATION****3 1 0 4****1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9**

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4**Skill Development****Employability****Entrepreneurship**

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, “Restructuring Electrical Power Systems”, Marcel Decker Inc., 2001.
4. Steven Stoft, “ Power System Economics”, Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

19272E33C	CONTROL SYSTEM DESIGN FOR POWER ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explore conceptual bridges between the fields of Control Systems and Power Electronics
- To Study Control theories and techniques relevant to the design of feedback controllers in Power Electronics.

UNIT I MODELLING OF DC-TO-DC POWER CONVERTERS 9

Modelling of Buck Converter , Boost Converter ,Buck- Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter General Mathematical Model for Power Electronics Devices.

UNIT II SLIDING MODE CONTROLLER DESIGN 9

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces, Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter.

UNIT III APPROXIMATE LINEARIZATION CONTROLLER DESIGN 9

Linear Feedback Control, Pole Placement by Full State Feedback , Pole Placement Based on Observer Design ,Reduced Order Observers , Generalized Proportional Integral Controllers, Passivity Based Control , Sliding Mode Control Implementation of Buck Converter , Boost Converter ,Buck-Boost Converter.

UNIT IV NONLINEAR CONTROLLER DESIGN 9

Feedback Linearization Isidori's Canonical Form, Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced Order Observers.

UNIT V PREDICTIVE CONTROL OF POWER CONVERTERS 9

Basic Concepts, Theory, and Methods, Application of Predictive Control in Power Electronics, AC-DC-AC Converter System, Faults and Diagnosis Systems in Power Converters.

TOTAL:45 PERIODS**OUTCOMES:**

- Ability to understand an overview on modern linear and nonlinear control strategies for power electronics devices
- Ability to model modern power electronic converters for industrial applications
- Ability to design appropriate controllers for modern power electronics devices.

REFERENCES

1. Hebertt Sira-Ramírez, Ramón Silva-Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer 2012
2. Mahesh Patil, Pankaj Rodey, "Control Systems for Power Electronics: A Practical Guide", Springer India, 2015.
3. Blaabjerg José Rodríguez, "Advanced and Intelligent Control in Power Electronics and Drives" , Springer, 2014

Skill Development

Employability

Entrepreneurship

4. Enrique Acha, Vassilios Agelidis, Olimpo Anaya, TJE Miller, "Power Electronic Control in Electrical Systems", Newnes, 2002
5. Marija D. Aranya Chakraborty, Marija, "Control and Optimization Methods for Electric Smart Grids", Springer, 2012.

19272E33D

ADVANCED DIGITAL SIGNAL PROCESSING

LT P C 3003

COURSE OBJECTIVES

- To expose the students to the fundamentals of digital signal processing in frequency domain & its application
- To teach the fundamentals of digital signal processing in time-frequency domain & its application
- To compare Architectures & features of Programmable DSP processors & develop logical functions of DSP processors
- To discuss on Application development with commercial family of DSP processors
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

UNIT I FUNDAMENTALS OF DSP 12

Frequency interpretation, sampling theorem, aliasing, discrete-time systems, constant-coefficient difference equation. Digital filters: FIR filter design – rectangular, Hamming, Hanning windowing technique. IIR filter design – Butterworth filter, bilinear transformation method, frequency transformation. Fundamentals of multirate processing – decimation and interpolation.

UNIT II TRANSFORMS AND PROPERTIES 9

Discrete Fourier transform (DFT): - properties, Fast Fourier transform (FFT), DIT-FFT, and DIF-FFT. Wavelet transforms: Introduction, wavelet coefficients – orthonormal wavelets and their relationship to filter banks, multi-resolution analysis, and Haar and Daubechies wavelet.

UNIT III ADAPTIVE FILTERS 9

Wiener filters – an introduction. Adaptive filters: Fundamentals of adaptive filters, FIR adaptive filter – steepest descent algorithm, LMS algorithm, NLMS, applications – channel equalization. Adaptive recursive filters – exponentially weighted RLS algorithm.

UNIT IV ARCHITECTURE OF COMMERCIAL DIGITAL SIGNAL PROCESSORS 9

Introduction to commercial digital signal processors, Categorization of DSP processor – Fixed point and floating point, Architecture and instruction set of the TI TMS 320 C54xx and TMS 320 C6xxx DSP processors, On-chip and On-board peripherals – memory (Cache, Flash, SDRAM), codec, multichannel buffered I/O serial ports (McBSPs), interrupts, direct memory access (DMA), timers and general purpose I/Os.

UNIT V INTERFACING I/O PERIPHERALS FOR DSP BASED APPLICATIONS 6

Introduction, External Bus Interfacing Signals, Memory Interface, I/O Interface, Programmed I/O, Interrupts, Design of Filter, FFT Algorithm, Application for Serial Interfacing, DSP based Power Meter, Position control, CODEC Interface.

TOTAL : 45 PERIODS

Skill Development

Employability

Entrepreneurship

Note: Discussions / Exercise / practice on signal analysis, transforms, filter design concepts with simulation tools such as Matlab / Labview / CC studio will help the student understand signal processing concepts and DSP processors.

Overview of TMS320C54xx and TMS320C67xx /other DSP Starter Kits, Introduction to code composer studio (CCS), Board support library, Chip support library and Runtime support library, Generating basic signals, Digital filter design, Spectrum analysis, Adaptive filters, Speech and Audio processing applications.

OUTCOMES : After the completion of this course the student will be able to:

- Students will learn the essential advanced topics in DSP that are necessary for successful Postgraduate level research.
- Students will have the ability to solve various types of practical problems in DSP
- Comprehend the DFTs and FFTs, design and Analyze the digital filters, comprehend the Finite word length effects in Fixed point DSP Systems.
- The conceptual aspects of Signal processing Transforms are introduced.
- The comparison on commercial available DSP Processors helps to understand system design through processor interface.
- Improved Employability and **entrepreneurship** capacity due to knowledge up gradation on recent trends in embedded systems design.

REFERENCES:

1. John. G. Proakis, Dimitris G. Manolakis, "Digital signal processing", Pearson Edu, 2002
2. Sen M.Kuo,Woon-Seng S.Gan, "Digital Signal Processors- Pearson Edu, 2012
3. Ifeachor E. C., Jervis B. W, "Digital Signal Processing: A practical approach, Pearson- Education, PHI/ 2002
4. Shaila D. Apte, " Digital Signal Processing", Second Edition, Wiley, 2016.
5. Robert J.Schilling,Sandra L.Harris,"Introd. To Digital Signal Processing with Matlab",Cengage,2014.
6. Steven A. Tretter, "Communication System Design Using DSP Algorithms with Laboratory Experiments for the TMS320C6713™ DSK", Springer, 2008.
7. RulphChassaing and Donald Reay, "Digital Signal Processing and Applications with the TMS320C6713 and TMS320C6416 DSK", John Wiley & Sons, Inc., Hoboken, New Jersey,2008.
8. K.P. Soman and K.L. Ramchandran,Insight into WAVELETS from theory to practice, Eastern Economy Edition, 2008
9. B Venkataramani and M Bhaskar "Digital Signal Processors", TMH, 2nd, 2010
10. Vinay K.Ingle,John G.Proakis,"DSP-A Matlab Based Approach",Cengage Learning,2010
11. Taan S.Elali,"Discrete Systems and Digital Signal Processing with Matlab",CRC Press2009.
12. Monson H. Hayes, "Statistical Digital signal processing and modelling", John Wiley & Sons, 2008.
13. Avatar Sing, S. Srinivasan, "Digital Signal Processing- Implementation using DSP Microprocessors with Examples from TMS320C54xx", Thomson India,2004.

19272E34A - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion— Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.-simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-III)

19272E34B - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS 9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

19272E34C SOFT COMPUTING TECHNIQUES**L T P C****OBJECTIVES:****3 0 0 3**

- To expose the concepts of feed forward neural networks.
- To provide adequate knowledge about feed back neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about of FLC and NN toolbox

UNIT I INTRODUCTION AND ARTIFICIAL NEURAL NETWORKS 9

Introduction to intelligent systems- Soft computing techniques- Conventional Computing versus Swarm Computing - Classification of meta-heuristic techniques - Properties of Swarm intelligent Systems - Application domain - Discrete and continuous problems - Single objective and multi-objective problems -Neuron-Nerve structure and synapse- Artificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks- Mc Culloch Pitts neuron model- perceptron model- Adaline and Madaline- multilayer perception model- back propagation learning methods- effect of learning rule coefficient -back propagation algorithm- factors affecting back propagation training-applications.

UNIT II ARTIFICIAL NEURAL NETWORKS AND ASSOCIATIVE MEMORY 9

Counter propagation network- architecture- functioning & characteristics of counter Propagation network- Hopfield/ Recurrent network configuration - stability constraints associative memory and characteristics- limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture- classifications- Implementation and training - Associative Memory.

UNIT III FUZZY LOGIC SYSTEM 9

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control- Fuzzification inferencing and defuzzification-Fuzzy knowledge and rule bases-Fuzzy modeling and control schemes for nonlinear systems. Self organizing fuzzy logic control- Fuzzy logic control for nonlinear time delay system.

UNIT IV GENETIC ALGORITHM 9

Evolutionary programs - Genetic algorithms, genetic programming and evolutionary programming - Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators - Optimization problems using GA-discrete and continuous - Single objective and multi-objective problems - Procedures in evolutionary programming.

Skill Development**Employability****Entrepreneurship**

UNIT V**HYBRID CONTROL SCHEMES****9**

Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS – Fuzzy Neuron - Optimization of membership function and rule base using Genetic Algorithm – Introduction to Support Vector Machine - Evolutionary Programming-Particle Swarm Optimization - Case study – Familiarization of NN, FLC and ANFIS Tool Box.

TOTAL : 45 PERIODS**OUTCOMES:**

- Will be able to know the basic ANN architectures, algorithms and their limitations.
- Also will be able to know the different operations on the fuzzy sets.
- Will be capable of developing ANN based models and control schemes for non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.
- Will be competent to use hybrid control schemes and P.S.O and support vector Regressive.

TEXT BOOKS:

1. Laurene V. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms And Applications", Pearson Education.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India, 2008.
3. Zimmermann H.J. "Fuzzy set theory and its Applications" Springer international edition, 2011.
4. David E.Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, 2009.
5. W.T.Miller, R.S.Sutton and P.J.Webrose, "Neural Networks for Control" MIT Press", 1996.
6. T. Ross, "Fuzzy Logic with Engineering Applications", Tata McGraw Hill, New Delhi, 1995.
7. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)", MIT Press, 2004.
8. Corinna Cortes and V. Vapnik, " Support - Vector Networks, Machine Learning " 1995.

19272E34D
OBJECTIVES:

RESTRUCTURED POWER SYSTEM

LTPC
3003

- To introduce the restructuring of power industry and market models.
- To impart knowledge on fundamental concepts of congestion management.
- To analyze the concepts of locational marginal pricing and financial transmission rights.
- To illustrate about various power sectors in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNIT II TRANSMISSION CONGESTION MANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing- Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequacy – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service –Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

Skill Development

Employability

Entrepreneurship

UNIT V REFORMS IN INDIAN POWER SECTOR

9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

TOTAL : 45 PERIODS

OUTCOMES:

- Learners will have knowledge on restructuring of power industry
- Learners will understand basics of congestion management
- Learners will attain knowledge about locational margin prices and financial transmission rights
- Learners will understand the significance ancillary services and pricing of transmission network
- Learners will have knowledge on the various power sectors in India

REFERENCES

- 1 Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, “Restructured electrical power systems: operation, trading and volatility” Pub., 2001.
- 2 Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boelen, “Operation of restructured power systems”, Kluwer Academic Pub., 2001.
- 3 Paranjothi, S.R. , “Modern Power Systems” Paranjothi, S.R. , New Age International, 2017.
- 4 Sally Hunt,” Making competition work in electricity”, John Willey and Sons Inc. 2002.
- 5 Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley & Sons, 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

- Level 1: Prescribed Research
- Level 2: Bounded Research
- Level 3: Scaffolded Research
- Level 4: Self actuated Research
- Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:** **40 Marks**
 - Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
 - Seminar Review Presentation : 10 Marks
 - Literature Survey : 10 Marks
- **Semester Examination :** **60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews:** **40 Marks**
 - Review I : 10 Marks
 - Review II : 10 Marks
 - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report:** **40 Marks**
- **Viva- Voce Examination:** **20 Marks**
- **Total:** **100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

- **Continuous Internal Assessment:** **20 Marks**
 - Research Tools(Lab) : 10 Marks
 - Tutorial: 10 Marks
- **Model Paper Writing:** **40 Marks**
 - Abstract: 5 Marks
 - Introduction: 10 Marks
 - Discussion: 10 Marks
 - Review of Literature: 5 Marks
 - Presentation: 10 Marks
- **Semester Examination:** **40 Marks**
- **Total:** **100 Marks**



PRIST
DEEMED UNIVERSITY
VALLAM, THANJAVUR.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF EEE

M.TECH-POWER SYSTEMS (FULL TIME)

COURSE STRUCTURE -R2017

PRIST DEEMED UNIVERSITY**FACULTY OF ENGINEERING AND TECHNOLOGY**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME: M.TECH-POWER SYSTEMS (FULL TIME)**CURRICULUM -REGULATION 2017****SEMESTER - I**

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11D	Applied Mathematics For Electrical & Electronics Engineering	3	1	0	4
2	17272H12	System Theory	3	1	0	4
3	17272H13	Power System Modeling and Analysis	3	1	0	4
4	17272H14	Economic Operations of Power Systems-I	3	1	0	4
5	17272H15	High Voltage Direct Current Transmission System	3	1	0	4
6	17272E16_	Elective-I	3	1	0	4
7	17272L17	Power System Simulation Lab-I	0	0	3	3
8	17272CRS	Research Led Seminar				1
TOTAL						28

SEMESTER - II

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21	EHV power transmission	3	1	0	4
2	17272H22	Economic Operations of Power Systems-II	3	1	0	4
3	17272H23	Power System Protection	3	1	0	4
4	17272E24_	Elective -II	3	1	0	4
5	17272E25_	Elective -III	3	1	0	4
6	17272L26	Power System Simulation Lab-II	0	0	3	3
7	172TECWR	Technical Writing/Seminars	0	0	3	3
8	17272CRM	Research Methodology				3
9	17272CBR	Participation in Bounded Research				2
TOTAL						31

SEMESTER - III

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31	Electrical Transients in power systems	3	1	0	4
2	17272E32_	Elective -IV	3	1	0	4
3	17272E33_	Elective -V	3	1	0	4
4	17272E34_	Elective -VI	3	1	0	4
5	17272P35	Project work Phase-I	0	0	6	6
6	17272CSR	Design Project / Socio Technical Project (Scaffolded Research)				4
TOTAL						26

SEMESTER - IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272P44	Project work Phase-II	0	0	12	12

Total Credits = 97**Elective -I**

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E16A	Analysis of Inverters	3	1	0	4
2.	17272E16B	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective -II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E24A	Flexible AC Transmission system	3	1	0	4
2.	17272E24B	Power System Planning and Reliability	3	1	0	4

Elective -III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E25A	Wind Energy conversion systems	3	1	0	4
2.	17272E25B	AI Techniques to Power Systems	3	1	0	4

Elective -IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E32A	Power Electronics applications in Power systems	3	1	0	4
2.	17272E32B	Power system Dynamics	3	1	0	4

Elective -V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33A	Power Conditioning	3	1	0	4
2.	17272E33B	Power system restructuring and deregulation	3	1	0	4

Elective -VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E34A	Software for Control system Design	3	1	0	4
2.	17272E34B	Industrial Power system analysis and design	3	1	0	4

SYLLABUS

**17248S11D - APPLIED MATHEMATICS FOR ELECTRICAL & ELECTRONICS
ENGINEERING 3 1 0 4**

1. **ADVANCED MATRIX THEORY** **9**
Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.
2. **RANDOM PROCESSES** **9**
Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .
3. **LINEAR PROGRAMMING** **9**
Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.
4. **DYNAMIC PROGRAMMING** **9**
Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.
5. **INTEGRAL TRANSFORMS** **9**
Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of $J_n(p) = 0$, Transform of

$$\frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx}, \text{ and Transform of } \frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx} - \frac{n^2f}{x^2}$$

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).

5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

17272H12 - SYSTEM THEORY**3 1 0 4****1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT 9**

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS 9

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS 9

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS 9

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY 9

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

17272H13 - POWER SYSTEM MODELLING AND ANALYSIS**3 1 0 4****1. SOLUTION TECHNIQUE****9**

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS**9**

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW**9**

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS**9**

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS**9**

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES:**

1. G W Stagg, A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol: AC-18, pp: 333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization: Basic Computational Algorithm and Programming Techniques; pp: 75-96; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd, Academic Press, 1971.

SEMESTER - I**17272H14 - ECONOMIC OPERATIONS OF POWER SYSTEMS-I****3 1 0 4****1. INTRODUCTION****9**

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM**9**

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney’s method and SLP – development of model and algorithm – MVAR planning – optimal sitting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING**9**

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT**9**

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING**9**

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Allen J.Wood and Bruce F.Wollenberg, “Power generation and control”, John Wiley & Sons, New York, 1984.
2. Krichmayer L., “Economic operation of power systems”, John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, “Economic control of Interconnected systems”, Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., “Electric energy systems theory – an introduction”, McGraw Hill, New Delhi, 1971.

17272H15- HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM**3 1 0 4**

- 1. DC POWER TRANSMISSION TECHNOLOGY** **9**
Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.
- 2. ANALYSIS OF HVDC CONVERTERS** **9**
Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.
- 3. CONVERTER AND HVDC SYSTEM CONTROL** **9**
General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.
- 4. HARMONICS AND FILTERS** **9**
Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.
- 5. SIMULATION OF HVDC SYSTEMS** **9**
Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

17272L17- POWER SYSTEM SIMULATION LABORATORY – I 0 0 3 3

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

17272H21 - EHV POWER TRANSMISSION**3 1 0 4****1. INTRODUCTION****9**

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS**9**

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS**9**

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS**9**

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES**9**

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

17272H22 - ECONOMIC OPERATIONS OF POWER SYSTEMS-II**3 1 0 4****1. AUTOMATIC GENERATION CONTROL****9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL**9**

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT**9**

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION**9**

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system- computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM**9**

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Kundur.P., "power system stability and control", McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A., "power system control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "power systems voltage stability", McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, "voltage stability of power system", Kluwer Academic Publishers, 1998.
7. Elgerd O.L., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

17272H23 - POWER SYSTEM PROTECTION**3 1 0 4****1. INTRODUCTION****9**

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION**9**

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION**9**

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING**9**

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING**9**

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Arun k. Phadke, James.S.Thorp, “ Computer relaying for power system”, John Wiley and sons, New York, 1988.
2. Jones D., “Analysis and protection of electrical power systems”, Pitman Publishing, 1971.
3. “Power system references manual, Ray rolls protection”, Orient press, 1982.
4. Stanly H., Horowitz (ED), “Protective relaying for power system”, IEEE press, 1980.
5. Kundur P., “power system stability and control”, McGraw Hill, 1994.

SEMESTER - II

17272L26- POWER SYSTEM SIMULATION LAB – II

0 0 3 3

LIST OF EXPERIMENTS:

1. **Small signal stability analysis: SMIB and Multi machine configuration.**
2. **Transients stability analysis of Multi – machine configuration.**
3. **Load Frequency control: single area, multi area control.**
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

17272H31 - ELECTRICAL TRANSIENTS IN POWER SYSTEMS**3 1 0 4****1. TRAVELLING WAVES ON TRANSMISSION LINE 9**

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

ELECTIVE- I (semester-I)**17272E16A - ANALYSIS OF INVERTERS****3 1 0 4****UNIT- I- SINGLE PHASE INVERTERS****9**

Introduction to self commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT-II- THREE PHASE VOLTAGE SOURCE INVERTERS**9**

180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT-III- CURRENT SOURCE INVERTERS**9**

Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters

UNIT-IV- MULTILEVEL INVERTERS**9**

Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT-V- RESONANT INVERTERS**9**

Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

L=45 T=15 P=0 C=4**TEXT BOOKS**

1. Rashid M.H., “Power Electronics Circuits, Devices and Applications ”, Prentice Hall India, Third Edition, New Delhi, 2004.
2. Jai P.Agrawal, “Power Electronics Systems”, Pearson Education, Second Edition, 2002.
3. Bimal K.Bose “Modern Power Electronics and AC Drives”, Pearson Education, Second Edition, 2003.
4. Ned Mohan,Undeland and Robbin, “Power Electronics: converters, Application and design” John Wiley and sons.Inc,Newyork,1995.
5. Philip T. krein, “Elements of Power Electronics” Oxford University Press -1998.

REFERENCES

1. P.C. Sen, “Modern Power Electronics”, Wheeler Publishing Co, First Edition, New Delhi, 1998.
2. P.S.Bimbra, “Power Electronics”, Khanna Publishers, Eleventh Edition, 2003.

17272E16B - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3 1 0 4

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

17272E24A - FLEXIBLE AC TRANSMISSION SYSTEM**3 1 0 4**

- 1. INTRODUCTION** **9**
 FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.
- 2. SERIES COMPENSATION SCHEMES** **9**
 Sub-Synchronous resonance, Torsional interaction, torsional torque, Compensation of conventional, ASC, NGH damping schemes, Modelling and control of thyristor controlled series compensators.
- 3. UNIFIED POWER FLOW CONTROL** **9**
 Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.
- 4. DESIGN OF FACTS CONTROLLERS** **9**
 Approximate multi-model decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, variable structure resistor control.
- 5. STATIC VAR COMPENSATION** **9**
 Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor(TSR), Thyristor switched capacitor(TSC), saturated reactor (SR) , and fixed capacitor (FC)

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40-45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems ", IEEE Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.
4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
5. Gyugyi L., " Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

17272E24B - POWER SYSTEM PLANNING AND RELIABILITY**3 1 0 4****1. LOAD FORECASTING****9**

Objectives of forecasting - Load growth patterns and their importance in planning – Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

2. GENERATION SYSTEM RELIABILITY ANALYSIS**9**

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of iso and interconnected generation systems.

3. TRANSMISSION SYSTEM RELIABILITY ANALYSIS**9**

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

4. EXPANSION PLANNING**9**

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

5. DISTRIBUTION SYSTEM PLANNING OVERVIEW**9**

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Proceeding of work shop on energy systems planning & manufacturing CI.
2. R.L .Sullivan, “ Power System Planning” ,.
3. Roy Billinton and Allan Ronald, “Power System Reliability.”
4. Turan Gonen, Electric power distribution system Engineering ‘McGraw Hill,1986

17272E25A - WIND ENERGY CONVERSION SYSTEMS**3 1 0 4****UNIT-I INTRODUCTION:****9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER**GENERATION:****9**

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS:**9**

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments-anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND**CONTROL ASPECTS:****9**

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanent magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY**9**

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power from the wind", Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

17272E25B - AI TECHNIQUES TO POWER SYSTEMS

3 1 0 4

- 1. INTRODUCTION TO NEURAL NETWORKS** **9**
Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.
- 2. APPLICATIONS TO POWER SYSTEM PROBLEMS** **9**
Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.
- 3. INTRODUCTION TO FUZZY LOGIC** **9**
Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.
- 4. APPLICATIONS TO POWER SYSTEMS** **9**
Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.
- 5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS** **9**
Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques”, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, 1993.
3. Zimmerman.H.J,„Fuzzy Set Theory and its Applications”, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems”, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering”, John Wiley & SonsLtd.,1998.

ELECTIVES – IV (semester-III)**17272E32A - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS****3 1 0 4****UNIT: I STATIC COMPENSATOR CONTROL 9**

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) - Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT 9

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL 9

Solid state excitation of synchronous generators - Different schemes - Generec excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM 9

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C =4**TEXT BOOK**

Miller. T.J.E, "Reactive power control in Electric systems". Wiley inter science, New York, 1982.

REFERENCES

1. "Static Compensator for AC power systems", Proc. IEE vol.128 Nov. 1981. pp 362-406.
2. "A Static alternative to the transformer on load tap changing", IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "Improvements in Thyristor controlled static on- load tap controllers for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Generec Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

ELECTIVES – IV (semester-III)**17272E32B- POWER SYSTEM DYNAMICS****3 1 0 4****1. SYNCHRONOUS MACHINE MODELLING****9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS**9**

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS**9**

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

ELECTIVES – V (semester-III)**17272E33A - POWER CONDITIONING****3 1 0 4****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)
3. Dugan.R.C, “ Electrical Power System Quality”, TMH,2008.

4. Arrillaga, A.J and Neville R. Watson, Power System Harmonics, John Wiley second Edition, 2003.

5. Derek A. Paice, "Power electronic converter harmonics", John Wiley & sons, 1999.

ELECTIVES – V (semester-III)

17272E33B – POWER SYSTEM RESTRUCTURING AND DEREGULATION

3 1 0 4

1. FUNDAMENTALS AND ARCHITECTURE OF POWER MARKETS 9

Deregulation of Electric utilities: Introduction- Unbundling- Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism –

Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, “Restructuring Electrical Power Systems”, Marcel Decker Inc., 2001.
4. Steven Stoft, “ Power System Economics”, Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

ELECTIVES – VI (semester-III)

17272E34A - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion— Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.- simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-III)

17272E34B - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES

9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES

9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS

9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS

9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS

9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate

programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:**

40 Marks

- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks
- Literature Survey : 10 Marks

- **Semester Examination : 60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews: 40 Marks**
 - Review I : 10 Marks
 - Review II : 10 Marks
 - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report: 40 Marks**
- **Viva- Voce Examination: 20 Marks**
- **Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

- **Continuous Internal Assessment: 20 Marks**
 - Research Tools(Lab) : 10 Marks
 - Tutorial: 10 Marks

- **Model Paper Writing: 40 Marks**
 - Abstract: 5 Marks
 - Introduction: 10 Marks
 - Discussion: 10 Marks
 - Review of Literature: 5 Marks
 - Presentation: 10 Marks

- **Semester Examination: 40 Marks**
- **Total: 100 Marks**



PRIST UNIVERSITY

VALLAM, THANJAVUR.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF EEE

M.TECH-POWER SYSTEMS (PART TIME)

COURSE STRUCTURE -R2017

PRIST UNIVERSITY**FACULTY OF ENGINEERING AND TECHNOLOGY**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME: M.TECH-POWER SYSTEMS (PART TIME)**CURRICULUM -REGULATION 2017****SEMESTER – I**

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11DP	Applied Mathematics For Electrical & Electronics Engineering	3	1	0	4
2.	17272H12P	System Theory	3	1	0	4
3.	17272H13P	Power System Modeling and Analysis	3	1	0	4
4.	17272L14P	Power System Simulation Lab-I	0	0	3	3
5.	17272CRSP	Research Led Seminar				1
TOTAL						16

SEMESTER – II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21P	EHV power transmission.	3	1	0	4
2	17272H22P	Power System Protection	3	1	0	4
3	17272E23_P	Elective-I	3	1	0	4
4	172TECW RP	Technical Writing/Seminars	0	0	3	3
5	17272CRMP	Research Methodology				3
6	17272CBRP	Participation in Bounded Research				2
TOTAL						20

SEMESTER - III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31P	Economic Operations of Power Systems-I	3	1	0	4
2	17272H32P	High Voltage Direct Current Transmission System	3	1	0	4
3	17272E33_P	Elective -II	3	1	0	4
4	17272L34P	Power System Simulation Lab-II	0	0	3	3
5	17272CSRP	Design Project / Socio Technical Project (Scaffolded Research)				4
TOTAL						19

SEMESTER - IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H41P	Economic Operations Of Power Systems-II	3	1	0	4
2	17272H42P	Electrical Transients in power systems	3	1	0	4
3	17272E43_P	Elective -III	3	1	0	4
4	17272P44P	Project work Phase -I	0	0	6	6
TOTAL						18

SEMESTER - V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272E51_P	Elective -IV	3	1	0	4
2.	17272E52_P	Elective -V	3	1	0	4
3.	17272E53_P	Elective -VI	3	1	0	4
TOTAL						12

SEMESTER - VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272P61P	Project work Phase -II	0	0	12	12

Total Credits = 87

Elective -I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E23AP	Flexible AC Transmission System	3	1	0	4
2.	17272E23BP	Power System Planning and Reliability	3	1	0	4

Elective -II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33AP	Analysis of Inverters	3	1	0	4
2.	17272E33BP	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective -III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E43AP	Wind Energy conversion systems	3	1	0	4
2.	17272E43BP	AI Techniques to Power Systems	3	1	0	4

Elective -IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E51AP	Power Electronics applications in Power systems	3	1	0	4
2.	17272E51BP	Power system Dynamics	3	1	0	4

Elective -V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E52AP	Power Conditioning	3	1	0	4
2.	17272E52BP	Power system restructuring and deregulation	3	1	0	4

Elective -VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E53AP	Software for Control system Design	3	1	0	4
2.	17272E53BP	Industrial Power system analysis and design	3	1	0	4

SYLLABUS

**17248S11DP -APPLIED MATHEMATICS FOR ELECTRICAL & ELECTRONICS
ENGINEERING**

3 1 0 4

1. **ADVANCED MATRIX THEORY** **9**
Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.
2. **RANDOM PROCESSES** **9**
Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .
3. **LINEAR PROGRAMMING** **9**
Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.
4. **DYNAMIC PROGRAMMING** **9**
Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.
5. **INTEGRAL TRANSFORMS** **9**
Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of $\frac{df}{dx}$ where p is a root of $J_n(p) = 0$, Transform of

$$\frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx}, \text{ and Transform of } \frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx} - \frac{n^2f}{x^2}$$

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).

5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

SEMESTER – I**17272H12P - SYSTEM THEORY****3 1 0 4****1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT 9**

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS 9

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS 9

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS 9

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY 9

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

17272H13P - POWER SYSTEM MODELLING AND ANALYSIS**3 1 0 4****1. SOLUTION TECHNIQUE****9**

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS**9**

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW**9**

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS**9**

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS**9**

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES:**

1. G W Stagg , A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol : AC-18, pp:333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization : Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd,Academic Press, 1971.

SEMESTER – I

17272L14P- POWER SYSTEM SIMULATION LAB – I

0 0 3 3

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

SEMESTER -II

17272H21P - EHV POWER TRANSMISSION**3 1 0 4****1. INTRODUCTION 9**

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS 9

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

SEMESTER – II**17272H22P - POWER SYSTEM PROTECTION****3 1 0 4****1. INTRODUCTION****9**

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION**9**

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION**9**

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING**9**

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING**9**

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Arun k. Phadke, James.S.Thorp, “ Computer relaying for power system”, John Wiley and sons, New York, 1988.
2. Jones D., “Analysis and protection of electrical power systems”, Pitman Publishing, 1971.
3. “Power system references manual, Ray rolls protection”, Orient press, 1982.
4. Stanly H., Horowitz (ED), “Protective relaying for power system”, IEEE press, 1980.
5. Kundur P., “power system stability and control”, McGraw Hill, 1994.

17272H31P - ECONOMIC OPERATIONS OF POWER SYSTEMS-I**3 1 0 4****1. INTRODUCTION 9**

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM 9

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal siting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT 9

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, "Economic control of Interconnected systems", Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

17272H32P- HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM**3 1 0 4****1. DC POWER TRANSMISSION TECHNOLOGY 9**

Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.

2. ANALYSIS OF HVDC CONVERTERS 9

Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.

3. CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.

4. HARMONICS AND FILTERS 9

Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.

5. SIMULATION OF HVDC SYSTEMS 9

Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

17272L34P- POWER SYSTEM SIMULATION LAB – II 0 0 3 3

LIST OF EXPERIMENTS:

1. Small signal stability analysis: SMIB and Multi machine configuration.
2. Transients stability analysis of Multi – machine configuration.
3. Load Frequency control: single area, multi area control.
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

17272H41P - ECONOMIC OPERATIONS OF POWER SYSTEMS-II 3 1 0 4**1. AUTOMATIC GENERATION CONTROL 9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL 9

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT 9

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION 9

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system- computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM 9

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C = 4

REFERENCES

1. Kundur.P., “power system stability and control”, McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A, “power system control and stability”, Galgotia publication, New Delhi, 1981.
3. Taylor C.W., “power systems voltage stability”, McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., “power system stability”, Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, “voltage stability of power system”, Kluwer Academic Publishers, 1998.
7. Elgerd O.L., “Electric energy systems theory – an introduction”, McGraw Hill, New Delhi, 1971.

17272H42P - ELECTRICAL TRANSIENTS IN POWER SYSTEMS**3 1 0 4****1. TRAVELLING WAVES ON TRANSMISSION LINE 9**

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level – overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

ELECTIVES – I (semester-II)**17272E23AP- FLEXIBLE AC TRANSMISSION SYSTEM****3 1 0 4**

- 1. INTRODUCTION** **9**
 FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.
- 2. SERIES COMPENSATION SCHEMES** **9**
 Sub-Synchronous resonance, Torsional interaction, torsional torque, Compensation of conventional, ASC, NGH damping schemes, Modelling and control of thyristor controlled series compensators.
- 3. UNIFIED POWER FLOW CONTROL** **9**
 Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.
- 4. DESIGN OF FACTS CONTROLLERS** **9**
 Approximate multi-model decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, variable structure resistor control.
- 5. STATIC VAR COMPENSATION** **9**
 Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor(TSR), Thyristor switched capacitor(TSC), saturated reactor (SR) , and fixed capacitor (FC)

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40-45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems ", IEEE Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.
4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
5. Gyugyi L., " Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

17272E23BP - POWER SYSTEM PLANNING AND RELIABILITY

3 1 0 4

1. LOAD FORECASTING 9

Objectives of forecasting - Load growth patterns and their importance in planning – Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

2. GENERATION SYSTEM RELIABILITY ANALYSIS 9

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of iso and interconnected generation systems.

3. TRANSMISSION SYSTEM RELIABILITY ANALYSIS 9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

4. EXPANSION PLANNING 9

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

5. DISTRIBUTION SYSTEM PLANNING OVERVIEW 9

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Proceeding of work shop on energy systems planning & manufacturing CI.
2. R.L .Sullivan, “ Power System Planning”,.
3. Roy Billinton and Allan Ronald, “Power System Reliability.”
4. Turan Gonen, Electric power distribution system Engineering ‘McGraw Hill,1986

ELECTIVE- II (semester-III)**17272E33AP- ANALYSIS OF INVERTERS****3 1 0 4****UNIT- I- SINGLE PHASE INVERTERS****9**

Introduction to self commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT-II- THREE PHASE VOLTAGE SOURCE INVERTERS**9**

180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT-III- CURRENT SOURCE INVERTERS**9**

Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters

UNIT-IV- MULTILEVEL INVERTERS**9**

Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT-V- RESONANT INVERTERS**9**

Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

L=45 T=15 P=0 C=4**TEXT BOOKS**

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.
2. Jai P.Agrawal, "Power Electronics Systems", Pearson Education, Second Edition, 2002.
3. Bimal K.Bose "Modern Power Electronics and AC Drives", Pearson Education, Second Edition, 2003.
4. Ned Mohan, Undeland and Robbin, "Power Electronics: converters, Application and design" John Wiley and sons.Inc,Newyork,1995.
5. Philip T. krein, "Elements of Power Electronics" Oxford University Press -1998.

REFERENCES

1. P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.
2. P.S.Bimbra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003.

17272E33BP - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3 1 0 4

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

ELECTIVES – III (semester-IV)

17272E43AP - WIND ENERGY CONVERSION SYSTEMS

3 1 0 4

UNIT-I INTRODUCTION:

9

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER

GENERATION:

9

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS:

9

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments-anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND

CONTROL ASPECTS:

9

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanent magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY

9

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin & co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power from the wind", Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

17272E43BP - AI TECHNIQUES TO POWER SYSTEMS

3 1 0 4

1. INTRODUCTION TO NEURAL NETWORKS 9

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS 9

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC 9

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS 9

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS

9

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C = 4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques”, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, 1993.
3. Zimmerman.H.J,„Fuzzy Set Theory and its Applications”, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems”, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering”, John Wiley & SonsLtd.,1998.

ELECTIVES – IV (semester-V)**17272E51AP - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS****3 1 0 4****UNIT: I STATIC COMPENSATOR CONTROL 9**

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) - Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT 9

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL 9

Solid state excitation of synchronous generators - Different schemes - Generec excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM 9

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C = 4**TEXT BOOK**

Miller. T.J.E, "Reactive power control in Electric systems". Wiley inter science, New York, 1982.

REFERENCES

1. "Static Compensator for AC power systems", Proc. IEE vol.128 Nov. 1981. pp 362-406.
2. "A Static alternative to the transformer on load tap changing", IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "Improvements in Thyristor controlled static on- load tap controllers for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Generec Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

ELECTIVES – IV (semester-V)**17272E51BP - POWER SYSTEM DYNAMICS 3 1 0 4****1. SYNCHRONOUS MACHINE MODELLING 9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

ELECTIVES – V (semester-V)**17272E52AP - POWER CONDITIONING****3 1 0 4****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)

3. Dugan.R.C, “ Electrical Power System Quality”,TMH,2008.
 4. Arrillga.A.J and Neville R. Watson, Power System Harmonics, John Wiley second Edition,2003.
 5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.
- ELECTIVES – V (semester-V)*

17272E52BP – POWER SYSTEM RESTRUCTURING AND DEREGULATION

3 1 0 4

1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled

Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, “Restructuring Electrical Power Systems”, Marcel Decker Inc., 2001.
4. Steven Stoft, “ Power System Economics”, Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

ELECTIVES – VI (semester-V)

17272E53AP - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion– Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.- simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-V)

17272E53BP - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS 9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:**

40 Marks

- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks

● Literature Survey : 10 Marks

● Semester Examination : 60 Marks

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- Continuous Internal Assessment through Reviews: 40 Marks
 - Review I : 10 Marks
 - Review II : 10 Marks
 - Review III : 20 Marks
- Evaluation of Socio Technical Practicum Final Report: 40 Marks
- Viva- Voce Examination: 20 Marks
- Total: 100 Marks

Blueprint for assessment of student's performance in Research Methodology Courses

- Continuous Internal Assessment: 20 Marks
 - Research Tools(Lab) : 10 Marks
 - Tutorial: 10 Marks
- Model Paper Writing: 40 Marks
 - Abstract: 5 Marks
 - Introduction: 10 Marks
 - Discussion: 10 Marks
 - Review of Literature: 5 Marks
 - Presentation: 10 Marks
- Semester Examination: 40 Marks
- Total: 100 Marks



PRIST UNIVERSITY

VALLAM, THANJAVUR.

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF EEE

M.TECH-POWER SYSTEMS (PART TIME)

COURSE STRUCTURE -R2019

PRIST UNIVERSITY**FACULTY OF ENGINEERING AND TECHNOLOGY**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME: M.TECH-POWER SYSTEMS (PART TIME)**CURRICULUM -REGULATION 2019****SEMESTER – I**

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19248S11DP	Applied Mathematics For Electrical & Electronics Engineering	3	1	0	4
2.	19272C12P	System Theory	3	1	0	4
3.	19272C13P	Power System Modeling and Analysis	3	1	0	4
4.	19272L14P	Power System Simulation Lab-I	0	0	3	3
Research Skill development course (RSD course)						
5.	19272CRSP	Research Led Seminar	1	0	0	1
TOTAL						16

SEMESTER – II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272C21P	EHV power transmission.	3	1	0	4
2	19272C22P	Power System Protection	3	1	0	4
3	19272E23_P	Elective-I	3	0	0	3
4	192TECW RP	Technical Writing/Seminars	0	0	3	3
Research Skill development course (RSD course)						
5	19272CRMP	Research Methodology	3	0	0	3
6	19272CBRP	Participation in Bounded Research	2	0	0	2
TOTAL						19

SEMESTER – III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272C31P	Economic Operations of Power Systems-I	3	1	0	4
2	19272C32P	High Voltage Direct Current Transmission System	3	1	0	4
3	19272E33_P	Elective -II	3	0	0	3
4	19272L34P	Power System Simulation Lab-II	0	0	3	3
Research Skill development course (RSD course)						
5	19272CSRP	Design Project / Socio Technical Project	0	0	6	6
TOTAL						20

SEMESTER – IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272C41P	Economic Operations Of Power Systems-II	3	1	0	4
2	19272C42P	Electrical Transients in power systems	3	1	0	4
3	19272E43_P	Elective -III	3	0	0	3
4	19272P44P	Project work Phase -I	0	0	10	10
TOTAL						21

SEMESTER – V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19272E51_P	Elective –IV	3	0	0	3
2.	19272E52_P	Elective –V	3	0	0	3
3.	19272E53_P	Elective –VI	3	0	0	3
TOTAL						9

SEMESTER – VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	19272P61P	Project work Phase -II	0	0	15	15

Total Credits = 100

Elective -I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E23AP	Analysis and Design of Power Converters	3	0	0	3
2.	19272E23BP	Modeling and Analysis of Electrical Machines	3	0	0	3
3.	19272E23CP	Advanced Power System Dynamics	3	0	0	3
4.	19272E23DP	Design of Substations	3	0	0	3

Elective -II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E33AP	Smart Grid	3	0	0	3
2.	19272E33BP	Solar and Energy Storage Systems	3	0	0	3
3.	19272E33CP	Power System Reliability	3	0	0	3
4.	19272E33DP	Distributed Generation and Microgrid	3	0	0	3

Elective -III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E43AP	Wind Energy conversion systems	3	0	0	3
2.	19272E43BP	AI Techniques to Power Systems	3	0	0	3
3.	19272E43CP	Electrical Distribution System	3	0	0	3
4.	19272E43DP	Energy Management and Auditing	3	0	0	3

Elective -IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E51AP	Power Electronics applications in Power systems	3	0	0	3
2.	19272E51BP	Power system Dynamics	3	0	0	3

3.	19272E51CP	Electric Vehicles and Power Management	3	0	0	3
4.	19272E51DP	Electromagnetic Interference and Compatibility	3	0	0	3

Elective -V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E52AP	Power Conditioning	3	0	0	3
2.	19272E52BP	Power system restructuring and deregulation	3	0	0	3
3.	19272E52CP	Control System Design for Power Electronics	3	0	0	3
4.	19272E52DP	Advanced Digital Signal Processing	3	0	0	3

Elective -VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	19272E53AP	Software for Control system Design	3	0	0	3
2.	19272E53BP	Industrial Power system analysis and design	3	0	0	3
3.	19272E53CP	Soft Computing Techniques	3	0	0	3
4.	19272E53DP	Restructured Power System	3	0	0	3

Credit Distribution

Sem.	Core Courses						Elective Courses		Foundation Courses		Total Credits
	Theory Courses		Practical Courses		Courses on *RSD						
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	02	08	01	03	01	01	-	-	01	04	16
II	02	08	01	03	02	05	01	03	-	-	19
III	02	08	01	03	01	06	01	03	-	-	20
IV	02	08	01	10	-	-	01	03	-	-	21
V	-	-	-	-	-	-	03	09	-	-	09
VI	-	-	01	15	-	-	-	-	-	-	15
Total Credits										100	

*RSD-Research Skill Development

SYLLABUS

19248S11DP -APPLIED MATHEMATICS FOR ELECTRICAL & ELECTRONICS ENGINEERING

3 1 0 4

1. ADVANCED MATRIX THEORY 9

Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.

2. RANDOM PROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .

3. LINEAR PROGRAMMING 9

Basic concepts – Graphical and Simplex methods –Transportation problem –Assignment problem.

4. DYNAMIC PROGRAMMING 9

Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS 9

Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of $J_n(p) = 0$, Transform of

$$\frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx}, \text{ and Transform of } \frac{d^2f}{dx^2} + \frac{1}{x} \frac{df}{dx} - \frac{n^2f}{x^2}$$

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).
5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

SEMESTER – I**19272C12P - SYSTEM THEORY****3 1 0 4****1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT****9**

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS**9**

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS**9**

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS**9**

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY**9**

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

19272C13P - POWER SYSTEM MODELLING AND ANALYSIS**3 1 0 4****1. SOLUTION TECHNIQUE****9**

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS**9**

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW**9**

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS**9**

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS**9**

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES:**

1. G W Stagg , A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol : AC-18, pp:333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization : Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd,Academic Press, 1971.

SEMESTER – I

19272L14P- POWER SYSTEM SIMULATION LAB – I

0 0 3 3

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

SEMESTER -II**19272C21P - EHV POWER TRANSMISSION****3 1 0 4****1. INTRODUCTION 9**

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS 9

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

SEMESTER – II**19272C22P - POWER SYSTEM PROTECTION****3 1 0 4****1. INTRODUCTION****9**

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION**9**

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION**9**

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING**9**

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING**9**

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Arun k. Phadke, James.S.Thorp, “Computer relaying for power system”, John Wiley and sons, New York, 1988.
2. Jones D., “Analysis and protection of electrical power systems”, Pitman Publishing, 1971.
3. “Power system references manual, Ray rolls protection”, Orient press, 1982.
4. Stanly H., Horowitz (ED), “Protective relaying for power system”, IEEE press, 1980.
5. Kundur P., “power system stability and control”, McGraw Hill, 1994.

19272C31P - ECONOMIC OPERATIONS OF POWER SYSTEMS-I**3 1 0 4****1. INTRODUCTION 9**

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM 9

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney’s method and SLP – development of model and algorithm – MVAR planning – optimal siting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT 9

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

 $L = 45 \quad T = 15 \quad P = 0 \quad C = 4$ **REFERENCES**

1. Allen J.Wood and Bruce F.Wollenberg, “Power generation and control”, John Wiley & Sons, New York, 1984.
2. Krichmayer L., “Economic operation of power systems”, John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, “Economic control of Interconnected systems”, Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., “Electric energy systems theory – an introduction”, McGraw Hill, New Delhi, 1971.

19272C32P- HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM**3 1 0 4****1. DC POWER TRANSMISSION TECHNOLOGY 9**

Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.

2. ANALYSIS OF HVDC CONVERTERS 9

Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.

3. CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.

4. HARMONICS AND FILTERS 9

Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.

5. SIMULATION OF HVDC SYSTEMS 9

Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

19272L34P- POWER SYSTEM SIMULATION LAB – II 0 0 3 3

LIST OF EXPERIMENTS:

1. Small signal stability analysis: SMIB and Multi machine configuration.
2. Transients stability analysis of Multi – machine configuration.
3. Load Frequency control: single area, multi area control.
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

19272C41P - ECONOMIC OPERATIONS OF POWER SYSTEMS-II 3 1 0 4**1. AUTOMATIC GENERATION CONTROL 9**

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL 9

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT 9

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION 9

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system- computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM 9

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kundur.P., "power system stability and control", McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A., "power system control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "power systems voltage stability", McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, "voltage stability of power system", Kluwer Academic Publishers, 1998.
7. Elgerd O.L., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

19272C42P - ELECTRICAL TRANSIENTS IN POWER SYSTEMS**3 1 0 4**

- 1. TRAVELLING WAVES ON TRANSMISSION LINE 9**
Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.
- 2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9**
Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.
- 3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9**
Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)
- 4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9**
Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor
- 5. INSULATION CO-ORDINATION 9**
Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C = 4**REFERENCES**

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

ELECTIVES – I (semester-II)**19272E23AP- FLEXIBLE AC TRANSMISSION SYSTEM****3 1 0 4**

- 1. INTRODUCTION** **9**
 FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.
- 2. SERIES COMPENSATION SCHEMES** **9**
 Sub-Synchronous resonance, Torsional interaction, torsional torque, Compensation of conventional, ASC, NGH damping schemes, Modelling and control of thyristor controlled series compensators.
- 3. UNIFIED POWER FLOW CONTROL** **9**
 Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.
- 4. DESIGN OF FACTS CONTROLLERS** **9**
 Approximate multi-model decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, variable structure resistor control.
- 5. STATIC VAR COMPENSATION** **9**
 Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor(TSR), Thyristor switched capacitor(TSC), saturated reactor (SR) , and fixed capacitor (FC)

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40-45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems ", IEEE Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.
4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
5. Gyugyi L., " Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

ELECTIVES – I (semester-II)**19272E23BP - POWER SYSTEM PLANNING AND RELIABILITY****3 1 0 4****1. LOAD FORECASTING****9**

Objectives of forecasting - Load growth patterns and their importance in planning – Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

2. GENERATION SYSTEM RELIABILITY ANALYSIS**9**

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of iso and interconnected generation systems.

3. TRANSMISSION SYSTEM RELIABILITY ANALYSIS**9**

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

4. EXPANSION PLANNING**9**

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

5. DISTRIBUTION SYSTEM PLANNING OVERVIEW**9**

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

L = 45 T = 15 P = 0 C =4**REFERENCES**

1. Proceeding of work shop on energy systems planning & manufacturing CI.
2. R.L .Sullivan, “ Power System Planning”,.
3. Roy Billinton and Allan Ronald, “Power System Reliability.”
4. Turan Gonen, Electric power distribution system Engineering ‘McGraw Hill,1986

ELECTIVE- II (semester-III)**19272E33AP- ANALYSIS OF INVERTERS****3 1 0 4****UNIT- I- SINGLE PHASE INVERTERS 9**

Introduction to self commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT-II- THREE PHASE VOLTAGE SOURCE INVERTERS 9

180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT-III- CURRENT SOURCE INVERTERS 9

Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters

UNIT-IV- MULTILEVEL INVERTERS 9

Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT-V- RESONANT INVERTERS 9

Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

L=45 T=15 P=0 C=4**TEXT BOOKS**

1. Rashid M.H., “Power Electronics Circuits, Devices and Applications ”, Prentice Hall India, Third Edition, New Delhi, 2004.
2. Jai P.Agrawal, “Power Electronics Systems”, Pearson Education, Second Edition, 2002.
3. Bimal K.Bose “Modern Power Electronics and AC Drives”, Pearson Education, Second Edition, 2003.
4. Ned Mohan,Undeland and Robbin, “Power Electronics: converters, Application and design” John Wiley and sons.Inc,Newyork,1995.
5. Philip T. krein, “Elements of Power Electronics” Oxford University Press -1998.

REFERENCES

1. P.C. Sen, “Modern Power Electronics”, Wheeler Publishing Co, First Edition, New Delhi, 1998.
2. P.S.Bimbra, “Power Electronics”, Khanna Publishers, Eleventh Edition, 2003.

19272E33BP - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3 1 0 4

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IV DETERMINATION OF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

$$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$$

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

19272E43AP - WIND ENERGY CONVERSION SYSTEMS

3 1 0 4

UNIT-I INTRODUCTION: 9

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECTRIC POWER

GENERATION: 9

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS: 9

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments-anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND

CONTROL ASPECTS: 9

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanent magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY 9

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power from the wind", Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, "Wind Energy System", Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

19272E43BP - AI TECHNIQUES TO POWER SYSTEMS

3 1 0 4

1. INTRODUCTION TO NEURAL NETWORKS 9

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS 9

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC 9

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS 9

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS

9

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C = 4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques”, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, 1993.
3. Zimmerman.H.J.,„Fuzzy Set Theory and its Applications”, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems”, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering”, John Wiley & SonsLtd.,1998.

ELECTIVES – IV (semester-V)**19272E51AP - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS****3 1 0 4****UNIT: I STATIC COMPENSATOR CONTROL 9**

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) - Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT 9

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL 9

Solid state excitation of synchronous generators - Different schemes - Generec excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM 9

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C = 4**TEXT BOOK**

Miller. T.J.E, "Reactive power control in Electric systems". Wiley inter science, New York, 1982.

REFERENCES

1. "Static Compensator for AC power systems", Proc. IEE vol.128 Nov. 1981. pp 362-406.
2. "A Static alternative to the transformer on load tap changing", IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "Improvements in Thyristor controlled static on- load tap controllers for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Generec Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

ELECTIVES – IV (semester-V)**19272E51BP - POWER SYSTEM DYNAMICS 3 1 0 4****1. SYNCHRONOUS MACHINE MODELLING 9**

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad} -reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System; Control and protective functions; IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

ELECTIVES – V (semester-V)**19272E52AP - POWER CONDITIONING****3 1 0 4****1. INTRODUCTION****9**

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS**9**

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS**9**

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS**9**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT**9**

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4**REFERENCES:**

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)

3. Dugan.R.C, “ Electrical Power System Quality”,TMH,2008.
- 4.Arrillga.A.J and Neville R.Watson, Power System Harmonics, John Wiley second Edition,2003.
5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.

ELECTIVES – V (semester-V)

19272E52BP – POWER SYSTEM RESTRUCTURING AND DEREGULATION

3 1 0 4

1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled

Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, “Restructuring Electrical Power Systems”, Marcel Decker Inc., 2001.
4. Steven Stoft, “ Power System Economics”, Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

ELECTIVES – VI (semester-V)

19272E53AP - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion-- Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.- simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-V)

19272E53BP - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS 9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C = 4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:**

40 Marks

- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks

● Literature Survey : 10 Marks

● **Semester Examination** : **60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews:** **40 Marks**
 - Review I : 10 Marks
 - Review II : 10 Marks
 - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report:** **40 Marks**
- **Viva- Voce Examination:** **20 Marks**
- **Total:** **100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

- **Continuous Internal Assessment:** **20 Marks**
 - Research Tools(Lab) : 10 Marks
 - Tutorial: 10 Marks
- **Model Paper Writing:** **40 Marks**
 - Abstract: 5 Marks
 - Introduction: 10 Marks
 - Discussion: 10 Marks
 - Review of Literature: 5 Marks
 - Presentation: 10 Marks
- **Semester Examination:** **40 Marks**
- **Total:** **100 Marks**



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TAMILNADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

**DEPARTMENT
OF
COMPUTER SCIENCE AND ENGINEERING**

PROGRAM HANDBOOK

B.TECH-FULLTIME

[REGULATION 2020]

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

COURSE STRUCTURE

I-VIII SEMESTER CURRICULUM AND SYLLABI

B.TECH(FT)CSE [REGULATION 2019]

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S11	Communicative English	4	0	0	4
2.	20148S12	Engineering Mathematics I	4	0	0	4
3.	20149S13	Engineering Physics	3	0	0	3
4.	20149S14	Engineering Chemistry	3	0	0	3
5.	20154S15	Engineering Graphics	2	0	4	4
6.	20150S16	Problem Solving and Python Programming	3	0	0	3
PRACTICAL						
7.	20150L17	Problem Solving and Python Programming Lab	0	0	4	2
8.	20149L18	Physics and Chemistry Laboratory	0	0	4	2
9.	201VEA19	Value Education				-
TOTAL			19	0	12	25

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20147S21	Technical English	4	0	0	4
2	20148S22	Engineering Mathematics-II	4	0	0	4
3	20149S23A	Physics for Information Science	3	0	0	3
4	20149S24A	Environmental Science and Engineering	3	0	0	3
5	20153S25A	Basic Electrical, Electronics and Measurement Engineering	3	0	0	3
6	20150S26A	Programming in C	3	2	0	4
PRACTICAL						
7	20154L27	Engineering Practices Lab	0	0	4	2
8	20150L28A	C Programming Lab	0	0	4	2
9	201ICA29	Fundamentals of Indian Constitution and Economy				-
TOTAL			20	2	8	25

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S31A	Discrete Mathematics	4	0	0	4
2.	20150S32	Digital Principles and System Design	4	0	0	4
3.	20150C33	Data Structures	3	0	0	3
4.	20150C34	Object Oriented Programming	3	0	0	3
5.	20150S35	Communication Engineering	3	0	0	3
PRACTICAL						
6.	20150L36	Data Structures Laboratory	0	0	4	2
7.	20150L37	Object Oriented Programming Laboratory	0	0	4	2
8.	20150L38	Digital Systems Laboratory	0	0	4	2
9.	20150L39	Interpersonal Skills/Listening & Speaking	0	0	2	1
TOTAL			17	0	14	24

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20148S41A	Probability and Queuing Theory	4	0	0	4
2	20150C42	Computer Architecture	3	0	0	3
3	20150C43	Database Management Systems	3	0	0	3
4	20150C44	Design and Analysis of Algorithms	3	0	0	3
5	20150C45	Operating Systems	3	0	0	3
6	20150C46	Software Engineering	3	0	0	3
PRACTICAL						
7	20150L47	Database Management Systems Laboratory	0	0	4	2
8	20150L48	Operating Systems Laboratory	0	0	4	2
9	20150L49	Advanced Reading and Writing	0	0	2	1
Research Skill Based (RSB) Course						
10	19150CRS	Research Led Seminar				1
TOTAL			19	0	10	25

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20148S51A	Algebra and Number Theory	4	0	0	4
2	20150C52	Computer Networks	3	0	0	3
3	20150C53	Microprocessors and Microcontrollers	3	0	0	3
4	201__OE54__	Open Elective-I	3	0	0	3
5	20150C55	Theory of Computation	3	0	0	3
6	20150C56	Object Oriented Analysis and Design	3	0	0	3
PRACTICAL						
7	20150L57	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8	20150L58	Object Oriented Analysis and Design Laboratory	0	0	4	2
9	20150L59	Networks Laboratory	0	0	4	2
Research Skill Based (RSB) Course						
10	20150CRM	Research Methodology	3	0	0	3
TOTAL			22	0	12	28

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150C61	Internet Programming	3	0	0	3
2	20150C62	Artificial Intelligence	3	0	0	3
3	20150C63	Mobile Computing	3	0	0	3
4	20150C64	Compiler Design	3	2	0	4
5	20150C65	Distributed Systems	3	0	0	3
6	20150E66__	Elective-I	3	0	0	3
PRACTICAL						
7	20150L61	Internet Programming Laboratory	0	0	4	2
8	20150L62	Mobile Application Development Laboratory	0	0	4	2
9	20150L63	Mini Project	0	0	4	2
10	20150L64	Professional Communication	0	0	2	1
Research Skill Based (RSB) Course						
11	20150CBR	Participation in Bounded Research				1
TOTAL			18	2	14	27

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C	
THEORY							
1	20150S71	Principles of Management	3	0	0	3	
2	20150C72	Cryptography and Network Security	3	0	0	3	
3	20150C73	Cloud Computing	3	0	0	3	
4	201__OE74__	Open Elective-II	3	0	0	3	
5	20150E75__	Elective-II	3	0	0	3	
6	20150E76__	Elective-III	3	0	0	3	
PRACTICAL							
7	20150L77	Cloud Computing Laboratory	0	0	4	2	
8	20150L78	Security Laboratory	0	0	4	2	
Research Skill Based (RSB) Course							
9	20150CSR	Design/Socio-Technical Project				3	
			TOTAL	18	0	8	25

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C	
THEORY							
1	20150E81__	Elective-IV	3	0	0	3	
2	20150E82__	Elective-V	3	0	0	3	
PRACTICAL							
3	20150P83	Project Work	0	0	20	10	
4	20150PEE	Program Exit Examination				2	
			TOTAL	6	0	20	18

ELECTIVE I (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E66A	Data Warehousing and Data Mining	3	0	0	3
2	20150E66B	Software Testing	3	0	0	3
3	20150E66C	Embedded Systems	3	0	0	3
4	20150E66D	Graph Theory and Applications	3	0	0	3
5	20150E66E	Digital Signal Processing	3	0	0	3

ELECTIVEII(SEMESTERVII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E75A	BigData Analytics	3	0	0	3
2	20150E75B	MachineLearningTechniques	3	0	0	3
3	20150E75C	SoftwareProjectManagement	3	0	2	3
4	20150E75D	InternetofThings	3	0	0	3
5	20150E75E	ServiceOrientedArchitecture	3	0	0	3

ELECTIVEIII(SEMESTERVII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E76A	Multi-coreArchitecturesandProgramming	3	0	0	3
2	20150E76B	HumanComputerInteraction	3	0	0	3
3	20150E76C	C#and.NetProgramming	3	0	0	3
4	20150E76D	WirelessAdhocandSensorNetworks	3	0	2	3
5	20150E76E	AdvancedTopicsonDatabases	3	0	0	3

ELECTIVEIV(SEMESTERVIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E81A	DigitalImageProcessing	3	0	0	3
2	20150E81B	SocialNetworkAnalysis	3	0	0	3
3	20150E81C	InformationSecurity	3	0	0	3
4	20150E81D	CyberForensics	3	0	0	3
5	20150E81E	SoftComputing	3	0	0	3

ELECTIVEV(SEMESTERVIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E82A	InformationRetrievalTechniques	3	0	0	3
2	20150E82B	NaturalLanguageProcessing	3	0	2	3
3	20150E82C	ParallelAlgorithms	3	0	0	3
4	20150E82D	SpeechProcessing	3	0	0	3
5	20150E82E	FundamentalsofNanoScience	3	0	0	3

SKILLDEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OPENELECTIVE I(SEMESTER V)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	ECE	20152OE54A	BasicsOfBioMedicalInstrumentation	3	0	0	3
2.		20152OE54B	SensorsAndTransducers	3	0	0	3
3.	EEE	20153OE54A	IndustrialNanoTechnology	3	0	0	3
4.		20153OE54B	EnergyConservationandManagement	3	0	0	3
5.	MECH	20154OE54A	Renewableenergysources	3	0	0	3
6.		20154OE54B	AutomotiveSystems	3	0	0	3
7.	CIVIL	20155OE54A	AirPollutionAndControlEngineering	3	0	0	3
8.		20155OE54B	GeographicInformationSystems	3	0	0	3

OPENELECTIVE II(SEMESTER VII)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	ECE	20152OE74A	Robotics	3	0	0	3
2.		20152OE74B	ElectronicDevices	3	0	0	3
3.	EEE	20153OE74A	BasicCircuitTheory	3	0	0	3
4.		20153OE74B	IntroductionToRenewableEnergySystems	3	0	0	3
5.	MECH	20154OE74A	IndustrialSafety	3	0	0	3
6.		20154OE74B	TestingOfMaterials	3	0	0	3
7.	CIVIL	20155OE74A	GreenBuildingDesign	3	0	0	3
8.		20155OE74B	WasteWaterTreatment	3	0	0	3

TOTAL CREDITS-197**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them to listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONE SELF/FAMILY & FRIENDS 12

Reading-short comprehension passages, practice in skimming-scanning and predicting-Writing-completing sentences-- developing hints. Listening-short texts-short formal and informal conversations.Speaking-introducing oneself-exchanging personal information-Language development-Wh-Questions-asking and answering-yes or no questions-parts of speech. Vocabulary development--prefixes-suffixes-articles.-count/uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short listening texts)-register-Writing-paragraph writing-topics sentence-main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures -Listening-telephonic conversations.Speaking-sharing information of a person of a kind—greeting-taking leave-Language development-prepositions, conjunctions Vocabulary development-guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences Listening – listening to long texts and filling up the table-product description-narratives from different sources.Speaking-asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions-Vocabulary development – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading-comprehension-reading long texts-reading different types of texts-magazines Writing-letter writing, informal or personal letters-e-mails-conventions of personal email- Listening- listening to dialogues or conversations and completing exercises based on them.Speaking-speaking about oneself-speaking about one's friend-Language development- Tenses-simple present-simple past- present continuous and past continuous-Vocabulary development- synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading-long texts-close reading-Writing-brainstorming-writing short essays-developing an outline-identifying main and subordinate ideas- dialogue writing-Listening – listening to talks- conversations- Speaking –participating in conversations-short group conversations-Language development-modal verbs-present/past perfect tense - Vocabulary development-collocations- fixed and semi-fixed expressions.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English

TEXTBOOKS:

1. Board of Editors. **Using English** A Coursebook for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

REFERENCES:

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois. **English & Communication For Colleges**. Cengage Learning, USA: 2007
3. Redston, Chris & Gillies Cunningham **Face 2 Face (Pre-intermediate Student's Book & Workbook)** Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively: Developing Speaking Skills for Business English**. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeev Geeta. **Basic Communication Skills, Foundation Books: 2013.**

20148S12**ENGINEERING MATHEMATICS -I****L T P C****5 1 0 4****OBJECTIVES:**

The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation - Homogeneous functions and Euler's theorem - Total derivative - Change of variables - Jacobians - Partial differentiation of implicit functions - Taylor's series for functions of two variables - Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals - Volume of solids - Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATION 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogeneous equation of Euler's and Legendre's type - System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL: 60 PERIODS**OUTCOMES:**

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals. Apply various techniques in solving differential equations.

TEXTBOOKS:

1. Grewal B.S.,—Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III- Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problem only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problem only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1-7.4 and 7.8].

REFERENCES:

1. Anton, H., Bivens, I. and Davis, S., "Calculus", Wiley, 10th Edition, 2016.
2. Jain R. K. and Iyengar S. R. K.,—Advanced Engineering Mathematics, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K.,—Calculus "Volume I and II", S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S. C., "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M. D. and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

20149S13

ENGINEERING PHYSICS

L T P C
5 1 0 4

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER

12

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations– twisting couple - torsion pendulum: theory and experiment- bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS

12

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homo junction and hetero junction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS

12

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation– heat conduction in solids–thermal conductivity-Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS

12

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance– Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL: 60 PERIODS**OUTCOMES:****Upon completion of this course,**

- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- The students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXTBOOKS:

1. Bhattacharya, D.K. & Poonam, T. —Engineering Physics. Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. —Engineering Physics. Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. —Engineering Physics. Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physics. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers. Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with Modern Physics. W.H. Freeman, 2007.

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its application to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement. Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic converter) – enzyme catalysis – Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system - water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXTBOOKS:

- S.S.Dara and S.S.Umare, — A Textbook of Engineering Chemistry, S.Chand & Company LTD, New Delhi, 2015
- P.C.Jain and Monika Jain, — Engineering Chemistry, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
- S.Vairam, P.Kalyani and Suba Ramesh, — Engineering Chemistry, Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

- Friedrich Emich, — Engineering Chemistry, Scientific International PVT, LTD, New Delhi, 2014.
- Prasanta Rath, — Engineering Chemistry, Cengage Learning India PVT, LTD, Delhi, 2015.
- Shikha Agarwal, — Engineering Chemistry - Fundamentals and Applications, Cambridge University Press, Delhi, 2015.

20150S16	PROBLEMSOLVINGANDPYTHONPROGRAMMING	L	T	P	C
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OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEMSOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT VI FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, students will be able to**

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXTBOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, — An Introduction to Python— Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, — Introduction to Computation and Programming Using Python', Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, — Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, — Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, — Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
5. Charles Dierbach, — Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, — Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

OBJECTIVES:

- To develop in students, graphics skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) 1 Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and FreeHand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection – isometric scale–Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions -Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to:

- Familiarize with the fundamentals and standards of Engineering graphics
- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projections and solids and development of surfaces.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

- Visualize and project isometric and perspective sections of simple solids.

TEXTBOOKS:

1. Natrajan K. V.,—A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2008.

REFERENCES:

1. Bhatt N. D. and Panchal V. M., —Engineering Drawing, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C. M., —Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K. R., —Engineering Drawing (Vol. I & II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren J. and Duff, John M., —Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N. S. Parthasarathy and Vela Murali, —Engineering Graphics, Oxford University, Press, New Delhi, 2015.
6. 6. Shah M. B., and Rana B. C., —Engineering Drawing, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711–2001: Technical products Documentation–Size and layout of drawings sheets.
2. IS 9609 (Parts 0 & 1)–2001: Technical products Documentation–Lettering.
3. IS 10714 (Part 20)–2001 & SP 46–2003: Lines for technical drawings.
4. IS 11669–1986 & SP 46–2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4)–2001: Technical drawings–Projection Methods. Special points applicable to

University Examination on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
 2. All questions will carry equal marks of 20 each making a total of 100.
 3. The answer paper shall consist of drawings sheets of A3 size only.
- The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

LABORATORY

LP T C

0 0 3 2

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Program that takes command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

- Determination of rigidity modulus – Torsion pendulum
- Determination of Young's modulus by non-uniform bending method
- (a) Determination of wavelength, and particle size using Laser (b) Determination of acceptance angle in an optical fiber.
- Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
- Determination of wavelength of mercury spectrum – spectrometer grating
- Determination of band gap of semiconductor
- Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS**OUTCOMES:**

Upon completion of the course, the students will be able to:

- Apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

LIST OF EXPERIMENTS

- Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
- Determination of total, temporary & permanent hardness of water by EDTA method.
- Determination of DO content of water sample by Winkler's method.
- Determination of chloride content of water sample by argentometric method.
- Estimation of copper content of the given solution by Iodometry.
- Determination of strength of given hydrochloric acid using pH meter.
- Determination of strength of acids in a mixture of acids using conductivity meter.
- Estimation of iron content of the given solution using potentiometer.
- Estimation of iron content of the water sample using spectrophotometer (1,10-Phenanthroline/thiocyanate method).
- Estimation of sodium and potassium present in water using flame photometer.
- Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
- Pseudo first order kinetics- ester hydrolysis.
- Corrosion experiment- weight loss method.
- Determination of CMC.
- Phase change in a solid.
- Conductometric titration of strong acid vs strong base.

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TEXTBOOK:

- Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

OBJECTIVES:

- The Course prepares second semester engineering and Technology students to:
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- Speaking – Asking for and giving directions- Reading – reading short technical texts from journals- newspapers- Writing- purpose statements – extended definitions – issue- writing instructions
– checklists-recommendations-Vocabulary Development- technical vocabulary
Language Development – subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them- Speaking – describing a process- Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing- Writing- interpreting charts, graphs- Vocabulary Development- vocabulary used in formal letters/emails and reports Language Development- impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/talks on engineering/technology- Speaking – introduction to technical presentations- Reading – longer texts both general and technical, practice in speed reading; Writing- Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words.
Language Development- embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. Speaking – mechanics of presentations- Reading – reading for detailed comprehension- Writing- email etiquette- job application – cover letter – Résumé preparation (via email and hard copy)- analytical essays and issue based essays- Vocabulary Development- findings suitable synonyms- paraphrasing-. Language Development- clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; Speaking – participating in a group discussion - Reading – reading and understanding technical articles Writing – Writing reports- minutes of a meeting- accident and survey- Vocabulary Development- verbal analogies Language Development- reported speech.

TOTAL: 60 PERIODS**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

OUTCOMES:

Learners should be able to:

- Read technical texts and write area-specific text effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXTBOOKS:

1. Board of Editors. Fluency in English A Coursebook for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.Pand Saveetha.C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

OBJECTIVES:

- The Course prepares second semester engineering and Technology students to:
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises-
 Speaking- Asking for and giving directions- Reading- reading short technical texts from journals- newspaper papers-
 Writing- purpose statements – extended definitions – issue- writing instructions – checklists-
 recommendations- Vocabulary Development- technical Vocabulary Language
 Development- subject verb agreement- compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them- Speaking-
 describing a process- Reading- reading long technical texts- identifying the various transitions in a text-
 paragraphing- Writing- interpreting charts, graphs- Vocabulary Development-
 vocabulary used in formal letters/emails and reports Language Development- impersonal
 passive voice, numerical adjectives.

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 of sequence words- Vocabulary Development- sequence words- Misspelled
 words. Language Development- embedded sentences

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. Speaking – mechanics of presentations-
 Reading – reading for detailed comprehension- Writing- email etiquette- job application –
 cover letter- Résumé preparation (via email and hard copy)- analytical essays and issue based essays-
 Vocabulary Development- findings suitable synonyms- paraphrasing-. Language Development-
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UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

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 and understanding technical articles Writing- Writing reports- minutes of a
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 Language Development- reported speech.

TOTAL: 60 PERIODS**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

OUTCOMES:

Learners should be able to:

- Read technical texts and write area-specific text effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

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1. Board of Editors. Fluency in English A Coursebook for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana, N. Pand Saveetha, C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh, E. Engineering English. Orient Blackswan: Hyderabad, 2015
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

OBJECTIVES:

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem –

Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $w = z + c, cz, 1/z, z^2$ – Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60**PERIODS OUTCOMES: Learners should be able to:**

- After successfully completing the course, the student will have a good understanding of the following topics and their applications:
- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's

- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXTBOOKS:

1. Grewal B.S.,—Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., —Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K.,— Advanced Engineering Mathematics, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O'Neil, P.V. —Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S,—Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C.,—Advanced Engineering Mathematics—Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic and optical properties of materials and Nano-electronic devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 12

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, expression - Wiedemann-Franz law - Success and failures - electrons in metals - Particle in a three dimensional box - degenerate states - Fermi-Dirac statistics - Density of energy states - Electron in periodic potential - Energy bands in solids - tight binding approximation - Electron effective mass - concept of hole

UNIT II SEMICONDUCTOR PHYSICS 12

Intrinsic Semiconductors - Energy band diagram - direct and indirect bandgap semiconductors - Carrier concentration in intrinsic semiconductors - extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - variation of Fermi level with temperature and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 12

Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Ferromagnetism: origin and exchange interaction - saturation magnetization and Curie temperature - Domain Theory - M versus H behaviour - Hard and soft magnetic materials - examples and uses - Magnetic principle in computer data storage - Magnetic hard disc (GMR sensor).

UNIT IV OPTICAL PROPERTIES OF MATERIALS 12

Classification of optical materials - carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode - solar cell - LED - Organic LED - Laser diodes - Optical data storage techniques.

UNIT V NANODEVICES 12

Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser. Conductivity of metallic nanowires - Ballistic transport - Quantum resistance and conductance - Carbon nanotubes: Properties and applications.

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to:

- Gain knowledge on classical and quantum electron theories, and energy band structure,
- Acquire knowledge on basics of semiconductor physics and its applications in various devices,
- Get knowledge on magnetic properties of materials and their applications in data storage,
- Have the necessary understanding on the functioning of optical materials for optoelectronics,
- Understand the basics of quantum structures and their applications in carbon electronics..

TEXTBOOKS:

1. Jasprit Singh, — Semiconductor Devices: Basic Principles, Wiley 2012.
2. Kasap, S.O. — Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
3. Kittel, C. — Introduction to Solid State Physics, Wiley, 2005.

REFERENCES:

1. Garcia, N. & Damask, A. — Physics for Computer Science Students, Springer-Verlag, 2012.
2. Hanson, G.W. — Fundamentals of Nanoelectronics, Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. — Nanotechnology: Understanding Small Systems, CRC Press, 2014.

**20153S25A BASIC ELECTRICAL, ELECTRONICS AND
MEASUREMENT ENGINEERING**

OBJECTIVES:

- To understand the fundamentals of electronic circuit constructions
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the principles and operation of measuring instruments and transducers

UNIT I ELECTRICAL CIRCUITS ANALYSIS 12

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network- nodal analysis, mesh analysis-network theorems- Thevenin theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

UNIT II ELECTRICAL MACHINES 12

DC and AC ROTATING MACHINES: Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor- Brushless DC motors- Transformers- Introduction- types and construction, working principle of Ideal transformer- Emf equation- All day efficiency calculation.

UNIT III UTILIZATION OF ELECTRICAL POWER 12

Renewable energy sources- wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner- Electric circuit, construction and working principle. Batteries- NiCd, Pb Acid and Li ion- Charge and Discharge Characteristics, Protection- need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

UNIT IV ELECTRONIC CIRCUITS 12

PN Junction- V-I Characteristics of Diode, zener diode, Transistor configurations- amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723, LM 317.

UNIT V ELECTRICAL MEASUREMENT 12

Characteristic of measurement- errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification- thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope- CRO.

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to:

- Discuss the essentials of electric circuits and analysis.
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and common domestic loads.
- Introduction to measurement and metering for electric circuits.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

TEXTBOOKS:

1. D.P.Kothari and I.J.Nagarath, Basic Electrical and Electronics Engineering, McGraw Hill, 2016, Third Edition.
2. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCES:

1. S.B.Lal Seksena and Kaustuv Dasgupta, Fundamentals of Electrical Engineering, Cambridge, 2016
2. B.L.Theraja, Fundamentals of Electrical Engineering and Electronics, Chand & Co, 2008
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015
4. John Bird, — Electrical and Electronic Principles and Technology, Fourth Edition, Elsevier, 2010
5. Mittle, Mittal, Basic Electrical Engineering, 2nd Edition, Tata McGraw-Hill Edition, 2016.
6. C.L.Wadhwa, — Generation, Distribution and Utilisation of Electrical Energy, New Age international pvt.ltd., 2003.

OBJECTIVES:

- To study the nature and facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organisms and environment.
- To appreciate the importance of environment by assessing its impact on the human world.
- To envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

12

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threat to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hillslopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 12
 Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural

UNIT III ENVIRONMENTAL POLLUTION

12

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources –

Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 12

From unsustainable to sustainable development – urban problems related to energy – water conservation, rainwater harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization – environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and Control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation – central and state pollution control boards – Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 12

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental issues is at infant stage.
- Ignorance and incomplete knowledge has led to misconceptions.
- Development and improvement in std. of living has led to serious environmental disasters.

TEXTBOOKS:

1. Benny Joseph, _Environmental Science and Engineering_, Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, _Introduction to Environmental Engineering and Science_, 2nd edition, Pearson Education, 2004.

REFERENCES:

1. Dharmendra S. Sengar, _Environmental Law_, Prentice Hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, — Textbook of Environmental Studies I, Universities Press (I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, _Environmental Studies- From Crisis to Cure_, Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, — Environmental Science I, Cengage Learning India PVT, LTD, Delhi, 2014.

OBJECTIVES

- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING 12

Introduction to programming paradigms - Structure of C program- C programming: Data Types - Storage classes - Constants - Enumeration Constants - Keywords - Operators: Precedence and Associativity-Expressions-Input/Output statements, Assignment statements-Decision making statements - Switch statement - Looping statements - Pre-processor directives -Compilation process

UNIT II ARRAYS AND STRINGS 9+3

Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy - Selection sort, linear and binary search

UNIT III FUNCTIONS AND POINTERS 9+3

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) - Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions - Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers - Example Program: Sorting of names - Parameter passing: Pass by value, Pass by reference - Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

UNIT IV STRUCTURES 9+3

Structure - Nested structures - Pointer and Structures - Array of structures - Example Program using structures and pointers - Self-referential structures - Dynamic memory allocation - Singly linked list - typedef

UNIT V FILE PROCESSING 9+3

Files - Types of file processing: Sequential access, Random access - Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files - Commandline arguments

TOTAL: 60**PERIODS OUTCOMES:**

Learners should be able to:

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.
- Design applications using sequential and random access file processing.

TEXTBOOKS:

1. Reema Thareja,—Programming in C++, Oxford University Press, Second Edition, 2016.
2. Kernighan, B. W. and Ritchie, D. M.—The C Programming Language, Second Edition, Pearson Education, 2006

REFERENCES:

1. Paul Deitel and Harvey Deitel,—C How to Program, Seventh Edition, Pearson Publication
2. Juneja, B. L. and Anita Seth,—Programming in C++, CENGAGE Learning India Pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh,—Fundamentals of Computing and Programming in C++, First Edition, Oxford University Press, 2009
4. Anita Goel and Ajay Mittal,—Computer Fundamentals and Programming in C++, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

OBJECTIVES:

- To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**CIVIL ENGINEERING PRACTICE**

13

BUILDINGS:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBING WORKS:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing lines sketches for water supply and sewerage works.

(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOL ONLY:

(a) Study of the joints in roofs, doors, windows and furniture.

(b) Hands-on-exercise:

Woodwork, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

18

WELDING:

(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.

(b) Gas welding practice

BASIC MACHINING:

(a) Simple Turning and Tap turning

(b) Drilling Practice

SHEET METAL WORK:

(a) Forming & Bending:

(b) Model making –

Trays and funnels. (c)

Different type of joints.

MACHINE ASSEMBLY PRACTICE:

(a) Study of centrifugal pump

(b) Study of air conditioner

DEMONSTRATION:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear

and step cone pulley. (c) Fitting – Exercises –

Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 13

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS OUTCO

MES:

On successful completion of this course, the student will be able to:

- Fabricate carpentry components and pipe connections including plumbing works.
Use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2. Carpentry vice (fitted to workbench)	15 Nos.
3. Standard wood working tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools: (a) Rotary Hammer	2 Nos (b)
Demolition Hammer	2 Nos (c)
Circular Saw	2 Nos (d) Planer
	2 Nos (e) Hand
Drilling Machine	2 Nos (f) Jigsaw
	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each	
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

1. Programs using I/O statements and expressions.

2. Programs using decision-making constructs.

3. Write a program to find whether the given year is leap year or Not? (Hint: not every century year is a leap. For example 1700, 1800 and 1900 is not a leap year)

4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.

5. Check whether a given number is Armstrong number or not?

6. Given a set of numbers like <10,36,54,89,12,27>, find sum of weights based on the following conditions.

- 5 if it is a perfect cube.
- 4 if it is a multiple of 4 and divisible by 6.
- 3 if it is a prime number.

Sort the numbers based on the weight in the increasing order as shown below <10, its weight>, <36, its weight> <89, its weight>

7. Populate an array with height of persons and find how many persons are above the average height.

8. Populate a two-dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.

9. Given a string — a\$bcd./fg| find its reverse without changing the position of special characters.

(Example input: a@gh%;j and output: j@hg%;a)

10. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.

11. From a given paragraph perform the following using built-in functions:

- Find the total number of words.
- Capitalize the first word of each sentence.
- Replace a given word with another word.

12. Solve towers of Hanoi using recursion.

13. Sort the list of numbers using pass by reference.

14. Generate salary slip of employees using structures and pointers.

15. Compute internal marks of students for five different subjects using structures and functions.

16. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

17. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

Miniproject

18. Create a—Railway reservations system with the following modules

- Booking
- Availability checking
- Cancellation
- Prepare chart

TOTAL:60PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

- Develop C programs for simple applications making use of basic constructs, arrays and strings.
- Develop C programs involving functions, recursion, pointers, and structures.

OBJECTIVES:

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS

12

Propositional logic – Propositional equivalences – Predicates and quantifiers – Nested quantifiers – Rules of inference – Introduction to proofs – Proof methods and strategy.

UNIT II COMBINATORICS

12

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

UNIT III GRAPHS

12

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES

12

Algebraic systems – Semigroups and monoids – Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA

12

Partial ordering – Posets – Lattices as posets – Properties of lattices – Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, students would:**

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar, R., "Discrete Mathematical Structures with Application to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.

2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 12

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates- Theorems and Properties of Boolean Algebra- Boolean Functions- Canonical and Standard Forms- Simplification of Boolean Functions using Karnaugh Map- Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 12

Combinational Circuits – Analysis and Design Procedures- Binary Adder- Subtractor- Decimal Adder - Binary Multiplier- Magnitude Comparator - Decoders – Encoders– Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 12

Sequential Circuits- Storage Elements: Latches, Flip-Flops- Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters- HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 12

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 12

RAM – Memory Decoding – Error Detection and Correction- ROM- Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course, the student should be able to:

- Simplify Boolean functions using KMap
- Design and Analyze Combinational and Sequential Circuits
- Implement designs using Programmable Logic Devices
- Write HDL code for combinational and Sequential Circuits

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, —Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson Education, 2017.

REFERENCES:

1. G.K.Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill, 2003.

20150C33	DATASTRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADTs
- To learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation singly linked lists – circularly linked lists – doubly-linked lists – applications of lists – Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations – Applications – Evaluating arithmetic expressions – Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue – applications of queues.

UNIT III NONLINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – Threaded Binary Trees – AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

UNIT IV NONLINEAR DATA STRUCTURES – GRAPHS 9

Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort. Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

TEXTBOOKS:

1. Mark Allen Weiss, — Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson Education, 1997.
2. Reema Thareja, — Data Structures Using C++, Second Edition, Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, — Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
2. Aho, Hopcroft and Ullman, — Data Structures and Algorithms, Pearson Education, 1983.
3. Stephen G. Kochan, — Programming in C++, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — Fundamentals of Data Structures in C++, Second Edition, University Press, 2008

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a Java application with threads and generic classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS**10**

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES**9**

Inheritance – Superclasses- sub classes –Protected members–constructors in subclasses- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O**9**

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, StackTraceElements. Input/ Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING**8**

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING**9**

Graphics programming-Frame–Components-working with 2D shapes-Using color, fonts, and images -Basics of event handling-event handlers-adaptor classes-actions-mouse events-AWT event hierarchy - Introduction to Swing– layout management -Swing Components –Text Fields , Text Areas –Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS**OUTCOMES:****Upon completion of the course, students will be able to:**

- Develop Java programs using OOP principles
- Develop Java programs with the concepts in inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generic classes
- Develop interactive Java programs using swings

TEXTBOOKS:

1. Herbert Schildt, —Java The complete reference, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary Cornell, —Core Java Volume – Fundamentals, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, —Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner, —Java 2 Blackbook, Dreamtech press, 2011.
3. Timothy Budd, —Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the various analog and digital modulation techniques
- To study the principles behind information theory and coding
- To study the various digital communication techniques

UNIT I ANALOG MODULATION 9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

UNIT II PULSE MODULATION 9

Lowpass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL MODULATION AND TRANSMISSION 9

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers

UNIT IV INFORMATION THEORY AND CODING 9

Measure of information – Entropy – Source coding theorem – Shannon – Fan coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS 9

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.

TEXTBOOKS:

1. H Taub, DL Schilling, GS Saha, — Principles of Communication Systems | 3/e, TMH 2007
2. S.S. Haykin — Digital Communications | John Wiley 2005

REFERENCES:

1. B.P. Lathi, — Modern Digital and Analog Communication Systems |, 3rd edition, Oxford University Press, 2007
2. HPHsu, Schaum Outline Series — Analog and Digital Communications | TMH 2006
3. B. Sklar, Digital Communications Fundamentals and Applications | 2/e Pearson Education 2007.

OBJECTIVES:

- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

- Array implementation of Stack and Queue ADTs
- Array implementation of List ADT
- Linked list implementation of List, Stack and Queue ADTs
- Applications of List, Stack and Queue ADTs
- Implementation of Binary Trees and operations of Binary Trees
- Implementation of Binary Search Trees
- Implementation of AVL Trees
- Implementation of Heaps using Priority Queues.
- Graph representation and Traversal algorithms
- Applications of Graphs
- Implementation of searching and sorting algorithms
- Hashing – any two collision techniques

TOTAL:60PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Write functions to implement linear and non-linear data structure operations
- -linear data structure operations for solving a given problem
- -linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EBconnection (i.e domestic or commercial). Compute the bill amount using the following tariff.

If the type of the EBconnection is domestic, calculate the amount to be paid as follows:

- First 100 units -Rs. 1 per unit
- 101-200 units -Rs. 2.50 per unit
- 201-500 units -Rs. 4 per unit
- >501 units -Rs. 6 per unit

If the type of the EBconnection is commercial, calculate the amount to be paid as follows:

- First 100 units -Rs. 2 per unit
- 101-200 units -Rs. 4.50 per unit
- 201-500 units -Rs. 6 per unit
- >501 units -Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.

5. Write a program to perform string operations using ArrayList. Write functions for the following

- a. Append-add at end
- b. Insert-add at particular index
- c. Search
- d. List all string starts with given letter

6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

7. Write a Java program to implement user defined exception handling.

8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

9. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
 - a) Decimal manipulations
 - b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java programs with arraylist, exception handling and multithreading.
- Design applications using file processing, generic programming and event handling.

OBJECTIVES:

- To understand the various basic logic gates
- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits
- To understand and code with HDL programming

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implement Half/Full Adder and Subtractor.
4. Design and implement combinational circuits using MSI devices:
 - a. 4-bit binary adder/subtractor
 - b. Parity generator/checker
 - c. Magnitude Comparator
 - d. Application using multiplexers
5. Design and implement shift-registers.
6. Design and implement synchronous counters.
7. Design and implement asynchronous counters.
8. Coding combinational circuits using HDL.
9. Coding sequential circuits using HDL.
10. Design and implementation of a simple digital system (Mini Project).

TOTAL: 60 PERIODS**OUTCOMES:****Upon completion of the course, the students will be able to:**

- Implement simplified combinational circuits using basic logic gates
- Implement combinational circuits using MSI devices
- Implement sequential circuits like registers and counters
- Simulate combinational and sequential circuits using HDL

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**LABORATORY REQUIREMENT FOR A BATCH OF 30 STUDENTS HARDWARE:**

1. Digital trainer kits - 30
2. Digital ICs required for the experiments in sufficient numbers

SOFTWARE:

1. HDL simulator.

20150L39 INTERPERSONAL SKILLS/LISTENING & SPEAKING

L T P C

0 0 2 1

OBJECTIVES:**The Course will enable learner to:**

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

UNIT I

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings- describe health and symptoms- invite and offer- accept- decline - take leave - listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL: 30 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

TEXTBOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

20148C41A	PROBABILITY AND QUEUEING THEORY	L	T	P	C
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OBJECTIVES:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of queueing models and apply in engineering.
- To understand the significance of advanced queueing models.
- To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

12

UNIT I PROBABILITY AND RANDOM VARIABLES

Probability – Axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES **12**

Classification – Stationary process – Markov process – Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT IV QUEUEING MODELS **12**

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little’s formula - Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.

UNIT V ADVANCED QUEUEING MODELS **12**

Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL: 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students should be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of random processes in engineering disciplines.
- Acquire skills in analyzing queueing models.
- Understand and characterize phenomenon which evolve with respect to time in a

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

probabilistic manner

TEXTBOOKS:

1. Gross, D., Shortle, J.F., Thompson, J. and Harris, C.M., — "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2. Ibe, O.C., — "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.

REFERENCES:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman, D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.
- To understand the memory hierarchies, cache memories and virtual memories.
- To learn the different ways of communication with I/O devices.

9

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.

UNIT II ARITHMETIC FOR COMPUTERS

9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism

UNIT III PROCESSOR AND CONTROL UNIT

9

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISM

9

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY & I/O SYSTEMS

9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Understand the basic structure of computers, operations and instructions.
- Design arithmetic and logic unit.
- Understand pipelined execution and design control unit.
- Understand parallel processing architectures.
- Understand the various memory systems and I/O communication.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

TEXTBOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, Computer Organization and Architecture—Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture—A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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DATABASEMANAGEMENTSYSTEMS

L T P C

3 0 0 3

OBJECTIVES:

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNIT I RELATIONAL DATABASES 9

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases– Relational Model – Keys – Relational Algebra – SQL fundamentals– Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II DATABASE DESIGN 9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols– Two Phase Locking – Deadlock – Transaction Recovery– Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV IMPLEMENTATION TECHNIQUES 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V ADVANCED TOPICS 9

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

- Classify the modern and futuristic database applications based on size and complexity
- Map ER model to Relational model to perform database design effectively
- Write queries using normalization criteria and optimize queries
- Compare and contrast various indexing strategies in different database systems
- Appraise how advanced databases differ from traditional databases.

TEXTBOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, — Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, — Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J. Date, A. Kannan, S. Swamynathan, — An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, — Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.

OBJECTIVES:

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
- To understand differential algorithm design techniques.
- To understand the limitations of Algorithmic power.

UNIT I INTRODUCTION 9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms - Visualization

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force – Computing an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim's algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the differential algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

TEXTBOOKS:

1. AnanyLevitin,—IntroductiontotheDesignandAnalysisofAlgorithmsI,ThirdEdition,PearsonEducation, 2012.
2. EllisHorowitz,SartajSahniandSanguthevarRajasekaran,ComputerAlgorithms/C++,SecondEdition, Universities Press, 2007.

REFERENCES:

1. ThomasH.Cormen,CharlesE.Leiserson,RonaldL.RivestandCliffordStein,IntroductiontoAlgorithmsI, Third Edition, PHI Learning Private Limited, 2012.
2. AlfredV.Aho,JohnE.HopcroftandJeffreyD.Ullman,—DataStructuresandAlgorithmsI, Pearson Education, Reprint 2006.
3. HarshBhasin,—AlgorithmsDesignandAnalysisI,Oxforduniversitypress,2016.
4. S.Sridhar,—DesignandAnalysisofAlgorithmsI,Oxforduniversitypress,2014.
5. <http://nptel.ac.in/>

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM OVERVIEW

9

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT

9

Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III STORAGE MANAGEMENT

9

Main Memory - Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory - Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS

9

Mass Storage system - Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems - I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT V CASE STUDY

9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL: 45 PERIODS**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers.
- Compare iOS and Android Operating Systems.

TEXTBOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, — Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, — Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
2. Achyut S. Godbole, Atul Kahate, — Operating Systems, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, — Modern Operating Systems, Second Edition, Pearson Education, 2004.
4. Gary Nutt, — Operating Systems, Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, — Operating Systems, Third Edition, Pearson Education, 2004.
6. Daniel P. Bovet and Marco Cesati, — Understanding the Linux kernel, 3rd edition, O'Reilly, 2005.
7. Neil Smyth, — iPhone/iOS 4 Development Essentials – Xcode, Fourth Edition, Payload Media, 2011.

OBJECTIVES:

- Tounderstandthephasesinasoftwareproject
- TounderstandfundamentalconceptsofrequirementsengineeringandAnalysisModeling.
- Tounderstandthevarioussoftwaredesignmethodologies
- Tolearnvarioustestingandmaintenancemeasures

UNITISoftwarePROCESSANDAGILEDEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models– Introduction to Agility-Agile process-Extreme programming-XP Process.

UNITIIRequirementsANALYSISANDSPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNITIIISoftwareDESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNITIVTestingANDMAINTENANCE 9

Software testing fundamentals-Internal and external views of Testing-white box testing -basis path testing- control structure testing-black box testing- Regression Testing– Unit Testing– Integration Testing – Validation Testing –System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNITVProjectMANAGEMENT 9

Software Project Management: Estimation– LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection -Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

TOTAL:45PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Identify the key activities in managing a software project.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

- Apply systematic procedure for software design and deployment.

- Compare and contrast the various testing and maintenance.
- Manage project schedule, estimate project cost and effort required.

TEXTBOOKS:

1. Roger S. Pressman, — Software Engineering – A Practitioner’s Approach I, Seventh Edition, McGraw-Hill International Edition, 2010.
2. Ian Sommerville, — Software Engineering I, 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, — Fundamentals of Software Engineering I, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, — Software Engineering, A Precise Approach I, Wiley India, 2010.
3. Kelkar S. A., — Software Engineering I, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, — Software Engineering I, Tata McGraw-Hill Publishing Company Limited, 2007.
5. <http://nptel.ac.in>

OBJECTIVES:

- Theaimofthislaboratoryistoinculcatetheabilities of applyingtheprinciplesofthedatabasemanagement systems. This courseaims to preparethestudents for projects wherea proper implementation of databases will be required
 - Tounderstanddatadefinitionsanddatamanipulationcommands
 - Tolearntheuseofnestedandjoinqueries
 - Tounderstandfunctions,proceduresandproceduralextensionsofdatabases
 - Tobefamiliarwiththeuseofafrentendtool
 - Tounderstanddesignandimplementationoftypicaldatabaseapplications
1. DataDefinitionCommands,DataManipulationCommandsforinserting,deleting,updatingandretrieving Tables and Transaction Control statements
 2. DatabaseQuerying–Simplequeries,Nestedqueries,SubqueriesandJoins
 3. Views,Sequences,Synonyms
 4. DatabaseProgramming:ImplicitandExplicitCursors
 5. ProceduresandFunctions
 6. Triggers
 7. ExceptionHandling
 8. DatabaseDesignusingERmodeling,normalizationandImplementationforanyapplication
 9. DatabaseConnectivitywithFrontEndTools
 10. CaseStudyusingreallifedatabaseapplications

TOTAL:60PERIODS**OUTCOMES:****Uponcompletionofthecourse,thestudentwillbeableto:**

- Usetypicaldatadefinitionsandmanipulationcommands.
- DesignapplicationstotestNestedandJoinQueries
- ImplementsimpleapplicationsthatuseViews
- ImplementapplicationsthatrequireaFront-endTool
- CriticallyanalyzetheuseofTables,Views,FunctionsandProcedures

OBJECTIVES:

- To learn Unix commands and shell programming
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C program to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C program to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Banker's Algorithm for Deadlock Avoidance
9. Implementation of Deadlock Detection Algorithm
10. Write C program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition
 - a) First Fit
 - b) Worst Fit
 - c) Best Fit
12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms
 - a) FIFO
 - b) LRU
 - c) LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies
 - a) Sequential
 - b) Indexed
 - c) Linked

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms
- Implement Semaphores
- Create processes and implement IPC
- Analyze the performance of the various Page Replacement Algorithms
- Implement File Organization and File Allocation Strategies

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension-Read and recognize different text types-Predicting content using photos and title **Writing**-Plan before writing-Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

UNIT II

Reading-Read for details-Use of graphic organizers to review and aid comprehension **Writing**-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques- **Writing**- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV

Reading- Genre and Organization of Ideas- **Writing**-Email writing-visumes – Job application-project writing-writing convincing proposals.

UNIT V

Reading-Critical reading and thinking-understanding how the text positions the reader-identify **Writing**-Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXTBOOKS:

1. Gramer F. Margot and Colin S. Ward **Reading and Writing (Level 3)** Oxford University Press: Oxford, 2011
2. Debra Daise, Charl Norloff, and Paul Carne **Reading and Writing (Level 4)** Oxford University Press: Oxford, 2011

REFERENCES:

1. Davis, Jason and Rhonda L. Iss. **Effective Academic Writing (Level 3)** Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. **Enriching Speaking and Writing Skills. Second Edition.** Orient Blackswan: Hyderabad, 2012
3. Withrow, Jeans and et al. **Inspired to Write. Readings and Tasks to develop writing skills.** Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. **Critical Reading and Writing.** Routledge: United States of America, 2000

5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2000

OBJECTIVES:

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To introduce and apply the concepts of rings, finite fields and polynomials.
- To understand the basic concepts in number theory
- To examine the key questions in the Theory of Numbers.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

UNIT I GROUPS AND RINGS 12

Groups : Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem. Rings: Definition-Subrings-Integral domain -Field-Integer modulo n- Ring homomorphism.

UNIT II FINITE FIELDS AND POLYNOMIALS 9

Rings - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.

UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS 9

Division algorithm - Base-b representations - Number patterns - Prime and composite numbers - GCD - Euclidean algorithm - Fundamental theorem of arithmetic - LCM.

UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES 9

Linear Diophantine equations - Congruence's - Linear Congruence's - Applications: Divisibility tests - Modular exponentiation - Chinese remainder theorem - 2×2 linear systems.

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS 9

Wilson's theorem - Fermat's little theorem - Euler's theorem - Euler's Phi functions - Tau and Sigma functions.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Apply the basic notions of groups, rings, fields which will then be used to solve related problems.
- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Demonstrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate their mastery by solving non-trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.
- Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

TEXTBOOKS:

1. Grimaldi, R. Pand Ramana, B. V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007.
2. Koshy, T., —Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

REFERENCES:

1. Lidl, R. and Pitz, G., "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.
2. Niven, I., Zuckerman, H. S., and Montgomery, H. L., —An Introduction to Theory of Numbers, John Wiley and Sons, Singapore, 2004.
3. San Ling and Chaoping Xing, —Coding Theory— A first Course, Cambridge Publications, Cambridge, 2004.

OBJECTIVES:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

UNIT I INTRODUCTION AND PHYSICAL LAYER

9

Networks – Network Types – Protocol Layering – TCP/IP Protocol Suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA-LINK LAYER & MEDIA ACCESS

9

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER

9

Network Layer Services – Packet Switching – Performance – IPv4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMPv4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPv6 Addressing – IPv6 Protocol.

UNIT IV TRANSPORT LAYER

9

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER

9

WWW and HTTP – FTP – Email – Telnet – SSH – DNS – SNMP.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand the basic layers and its functions in computer networks.
- Evaluate the performance of a network.
- Understand the basics of how data flows from one node to another.
- Analyze and design routing algorithms.
- Design protocols for various functions in the network.
- Understand the working of various application layer protocols.

TEXT BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system.

UNIT I THE 8086 MICROPROCESSOR

9

Introduction to 8086 – Microprocessor architecture – Addressing modes – Instruction set and assembler directives – Assembly language programming – Modular Programming – Linking and Relocation – Stacks – Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE

9

8086 signals – Basic configurations – System bus timing – System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING

9

Memory Interfacing and I/O interfacing – Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER

9

Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER

9

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface – Stepper Motor and Waveform generation – Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TEXTBOOKS:

1. Yu-Cheng Liu, Glenn A. Gibson, — Microcomputer Systems: The 8086/8088 Family – Architecture, Programming and Design I, Second Edition, Prentice Hall of India, 2007. (UNIT I- III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, — The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson Education, 2011. (UNIT IV-V)

REFERENCES:

1. Douglas V. Hall, — Microprocessors and Interfacing, Programming and Hardware I, TMH, 2012
2. A. K. Ray, K. M. Bhurchandi, — Advanced Microprocessors and Peripherals — 3rd edition, Tata Mc Graw Hill, 2012

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To understand the language hierarchy
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems.

UNIT I AUTOMATA FUNDAMENTALS

9

Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

9

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES

9

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES

9

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V UNDECIDABILITY

9

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Construct automata, regular expression for any pattern.
- Write Context free grammar for any construct.
- Design Turing machines for any language.
- Propose computation solutions using Turing machines.
- Derive whether a problem is decidable or not.

TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.DUllman, — Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2003.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, — Elements of the theory of Computation, Second Edition, PHI, 2003.
2. J.Martin, — Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2003.
3. Micheal Sipser, — Introduction of the Theory and Computation, Thomson Brokecole, 1997

OBJECTIVES:

- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To test the software against its requirements specification

UNIT I UNIFIED PROCESS AND USE CASE DIAGRAMS

9

Introduction to OOAD with OO Basics - Unified Process - UML diagrams - Use Case - Case study - the Next Gen POS system, Inception - Use case Modelling - Relating Use cases - include, extend and generalization - When to use Use-cases

UNIT II STATIC UML DIAGRAMS

9

Class Diagram - Elaboration - Domain Model - Finding conceptual classes and description classes - Associations - Attributes - Domain model refinement - Finding conceptual class Hierarchies - Aggregation and Composition - Relationship between sequence diagrams and use cases - When to use Class Diagrams.

UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS

9

Dynamic Diagrams - UML interaction diagrams - System sequenced diagram - Collaboration diagram - When to use Communication Diagrams - State machine diagram and Modelling - When to use State Diagrams - Activity diagram - When to use activity diagrams

UNIT IV DESIGN PATTERNS

9

GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling - High Cohesion - Controller. Design Patterns - creational - factory method - structural - Bridge - Adapter - behavioural - Strategy - observer - Applying GoF design patterns - Mapping design to code.

UNIT V TESTING

9

Object Oriented Methodologies - Software Quality Assurance - Impact of object orientation on Testing - Develop Test Cases and Test Plans

TOTAL: 45 PERIODS**OUTCOMES: At the end of the course, the students should be able to:**

- Express software design with UML diagrams
- Design software applications using OO concepts
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern based design using design patterns
- Understand the various testing methodologies for OO software

TEXTBOOKS:

1. Craig Larman, - Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

REFERENCES:

1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, - Design patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.
2. Martin Fowler, - UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley, 2003.

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MICROPROCESSORS AND MICROCONTROLLER LABORATORY

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OBJECTIVES:

- To introduce ALP concepts, features and coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

7. Traffic light controller
8. Stepper motor control
9. Digital clock
10. Keyboard and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2's complement of a number
16. Unpacked BCD to ASCII

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Write ALP programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

- To capture the requirements specification for an intended software system
- To draw the UML diagrams for the given specification
- To map the design properly to code
- To test the software system thoroughly for all scenarios
- To improve the design by applying appropriate design patterns.

LIST OF EXPERIMENTS

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams.
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design.
8. Test the software system for all the scenarios identified as per the use case diagram.
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank.
3. Exam registration.
4. Stock maintenance system.
5. Online course reservations system.
6. Airline/Railway reservations system.
7. Software personnel management system.
8. Credit card processing.
9. e-book management system.
10. Recruitment system.
11. Foreign trading system.
12. Conference management system.
13. BPO management system.
14. Library management system.
15. Student information system.

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Upon completion of this course, the students will be able to:
- Perform OO analysis and design for a given problem specification.
- Identify and map basic software requirements in UML mapping.
- Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns.
- Test the compliance of the software with the SRS.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a webpage using TCP sockets.
3. Applications using TCP sockets like:
 - a. Echo client and echo server
 - b. Chat
 - c. File Transfer
4. Simulation of DNS using UDP sockets.
5. Write codes simulating ARP/RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/Link State Routing algorithm.
9. Performance evaluation of Routing protocols using Simulation tool.
10. Simulation of error correction code (like CRC).

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Implement various protocols using TCP and UDP
- Compare the performance of different transport layer protocols.
- Use simulation tools to analyze the performance of various network protocols.
- Analyze various routing algorithms.
- Implement error correction codes.

OBJECTIVES:

3

To create a basic appreciation towards research process and awareness of various research publication

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to standard laboratory precautions and best practices for experimental work
- To provide orientation for basic mathematical computation useful in basic research

UNIT I

9

Introduction to Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Research Design – Steps in selection and formulation of research problem – Steps in research – Criteria of Good Research, Problems Encountered by Researchers in India.

UNIT II

9

Research Problem: Definition of research problem, selecting the problem – Necessity of defining the problem – Techniques involved in defining the problem – Research design – Needs and features of good design – Different research design – Basic principles of experimental designs. Development of a research plan, Formulation of Hypothesis – Sampling techniques – Sampling error and sample size. Literature types – compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III

9

Methods of data collection – Primary and secondary data – observation – interview – Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises. Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection.

UNIT IV

9

Processing and analysis of data – editing – coding – transcription – tabulation – outline of statistical analysis – Uncertainty, accuracy and precision – Mean value; standard deviation; error on the mean – Using a spreadsheet for data analysis – Graphs and graph plotting – Least squares methods – descriptive statistics – elements of processing through computer – packages for analysis (Excel)

UNIT V

9

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure – writing research abstract – introduction, review of literature, result, conclusions, Concepts of Bibliography and references, Technical Presentation.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

TEXTBOOKS:

I.C.R.Kothari,ResearchMethodology,NewAgeInternationalPublishers,NewDelhi,2004.

REFERENCES:

1. Rajammal.P.Devadas,1976,Ahandbookofmethodologyofresearch,RMMVidyalayaPress.
2. R.ADayandA.L.Underwood,Quantitativeanalysis,PrenticeHall,1999.
3. R.Gopalan,Thisiswriting,VijayNicoleImprintsPrivateLtd.,2005.
4. W.J.DeCoursey,StatisticsandProbabilityforEngineeringApplicationsWithMicrosoft@Excel,Newnes,2003.
5. ArchibaldFrapp,JonFrapp,MichaelFrapp;Just-in-TimeMathforEngineers,ElsevierScience&Technology Books, 2003.

OBJECTIVES:

- To understand different Internet Technologies
- To learn java-specific web services architecture To design a context free grammar for any given language

UNIT I WEBSITE BASICS, HTML5, CSS3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations

UNIT II CLIENT SIDE PROGRAMMING 9

JavaScript: An introduction to JavaScript – JavaScript DOM Model – Date and Objects, – Regular Expressions – Exception Handling – Validation – Built-in objects – Event Handling – DHTML with JavaScript – JSON introduction – Syntax – Function Files – Http Request – SQL

UNIT III SERVER SIDE PROGRAMMING 9

Servlets: Java Servlet Architecture – Servlet Life Cycle – Form GET and POST actions – Session Handling – Understanding Cookies – Installing and Configuring Apache Tomcat Web Server – DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages – JSP Standard Tag Library (JSTL) – Creating HTML forms by embedding JSP code

UNIT IV PHP and XML 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database. XML: Basic XML – Document Type Definition – XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM)

UNIT V INTRODUCTION TO AJAX and WEBSERVICES 9

AJAX: Ajax Client Server Architecture – XMLHttpRequest Object – Callback Methods: Web Services: services (WSDL) – Consuming a web service, Database Driven web service from an application – SOAP

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Construct a basic website using HTML and Cascading Style Sheets
- Build dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
- Develop server side programs using Servlets and JSP

- ConstructsimplewebpagesinPHPandto represent datainXMLformat.
- UseAJAXandwebservicestodevelopinteractivewebapplicationsDerivewhetheraproblem is decidable or not.

TEXTBOOKS:

1.J.DeitelandDeitelandNieto,—InternetandWorldWideWeb-HowtoProgramI,Prentice Hall, 5th Edition, 2011.

REFERENCES:

1. StephenWynkoopandJohnBurke—RunningaPerfectWebsiteI, QUE,2ndEdition,1999.
2. ChrisBates, WebProgramming— BuildingIntranetApplications,3rdEdition, WileyPublications, 2009.
3. JeffreyCandJackson,—WebTechnologiesAComputerSciencePerspectiveI, PearsonEducation, 2011.
4. GopalanN.P.andAkilandeswariJ.,—WebTechnologyI,PrenticeHallofIndia,2011.
5. UttamK.Roy,—WebTechnologiesI,OxfordUniversityPress,2011.

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI

UNIT I INTRODUCTION

9

Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS

9

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games - Alpha - Beta Pruning - Stochastic Games

UNIT III KNOWLEDGE REPRESENTATION

9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining - Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV SOFTWARE AGENTS

9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS

AI applications – Language Models – Information Retrieval - Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Use appropriate search algorithms for any AI problem
- Represent a problem using first order and predicate logic
- Provide the apt agent strategy to solve a given problem
- Design software agents to solve a problem
- Design applications for NLP that use Artificial Intelligence.

TEXTBOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. I. Bratko, —Prolog: Programming for Artificial Intelligence I, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

REFERENCES:

1. M. Tim Jones, — Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, — The Quest for Artificial Intelligence, Cambridge University Press, 2009
3. William F. Clocksin and Christopher S. Mellish, | Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, — Multi Agent Systems I, Second Edition, MIT Press, 2013
5. David L. Poole and Alan K. Mackworth, — Artificial Intelligence: Foundations of Computational Agents I, Cambridge University Press, 2010.

OBJECTIVES:

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system.
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

UNIT I INTRODUCTION 9

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT II MOBILE TELECOMMUNICATIONS SYSTEM 9

Introduction to Cellular Systems- GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT III MOBILE NETWORK LAYER 9

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV Hybrid routing –ZRP, Multicast Routing-ODMRP, Vehicular Ad Hoc networks(VANET)–MANETVs VANET – Security.

UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER 9

Mobile TCP–WAP–Architecture–WDP–WTLS–WTP–WSP–WAE–WTA Architecture– WML

UNIT V MOBILE PLATFORMS AND APPLICATIONS 9

Mobile Device Operating Systems– Special Constraints & Requirements–Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone –MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

TEXTBOOKS:

1. Jochen Schiller, — Mobile Communications I, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, — Fundamentals of Mobile Computing I, PHI Learning Pvt.Ltd, New Delhi – 2012

REFERENCES:

1. DharmaPrakashAgarval, QingandAnZeng, "IntroductiontoWirelessandMobilesystems", Thomson Asia Pvt Ltd, 2005.
2. UweHansmann, LotharMerk, MartinS. NicklonsandThomasStober, —Principlesof
3. MobileComputingI, Springer, 2003.
4. William. C. Y. Lee, —MobileCellularTelecommunications-AnalogandDigitalSystemsI,
5. SecondEdition, TataMcGrawHillEdition, 2006.
6. C.K. Toh, —AdHoc MobileWirelessNetworksI, FirstEdition, PearsonEducation, 2002.
7. AndroidDevelopers:<http://developer.android.com/index.html>
8. AppleDeveloper:<https://developer.apple.com/>
9. WindowsPhoneDevCenter:<http://developer.windowsphone.com>
10. BlackBerryDeveloper:<http://developer.blackberry.com>

OBJECTIVES:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT I INTRODUCTION TO COMPILERS

9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II SYNTAX ANALYSIS

9

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR(0) Item Construction of SLR Parsing Table- Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC..

UNIT III INTERMEDIATE CODE GENERATION

9

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION

9

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

9

UNIT V CODE OPTIMIZATION

Principal Sources of Optimization – Peep-hole optimization – DAG – Optimization of Basic Blocks – Global Data Flow Analysis - Efficient Data Flow Algorithm.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand the different phases of compiler.
- Design a lexical analyzer for a sample language.
- Apply different parsing algorithms to develop the parsers for a given grammar.
- Understand syntax-directed translation and run-time environment.
- Learn to implement code optimization techniques and a simple code generator.
- Design and implement a scanner and a parser using LEX and YACC tools.

TEXTBOOKS:

1. J.Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Pearson Education, 2009.

REFERENCES:

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C, Prentice-Hall Software Series, 1993.

OBJECTIVES:

- To understand the foundations of distributed systems.
- To learn issues related to clock synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT I INTRODUCTION

9

Introduction: Definition – Relation to computer system components – Motivation – Relation to parallel systems – Message-passing systems versus shared memory systems – Primitives for distributed communication – Synchronous versus asynchronous executions – Design issues and challenges. A model of distributed computations: A distributed program – A model of distributed executions – Models of communication networks – Global state – Cuts – Past and future cones of an event – Models of process communications. Logical Time: A framework for a system of logical clocks – Scalar time – Vector time – Physical clock synchronization: NTP.

UNIT II MESSAGE ORDERING & SNAPSHOTS

9

Message ordering and group communication: Message ordering paradigms – Asynchronous execution with synchronous communication – Synchronous program order on an asynchronous system – Group communication – Causal order (CO) – Total order. Global state and snapshot recording algorithms: Introduction – System model and definitions – Snapshot algorithms for FIFO channels.

9

UNIT III DISTRIBUTED MUTEX & DEADLOCK

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawal algorithm – Maekawa's algorithm – Suzuki-Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

9

UNIT IV RECOVERY & CONSENSUS

Checkpointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V P2P & DISTRIBUTED SHARED MEMORY

9

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models – Shared memory Mutual Exclusion.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Elucidate the foundations and issues of distributed systems
- Understand the various synchronization issues and global state for distributed systems.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

- Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
 - Describe the features of peer-to-peer and distributed shared memory systems.

TEXTBOOKS:

1. Kshemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimore and Tim Kindberg, — Distributed Systems Concepts and Design, Fifth Edition, Pearson Education, 2012.

REFERENCES:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Mukesh Singhal and Niranjana G. Shivaratri. Advanced concepts in operating systems. McGraw-Hill, Inc., 1994.
3. Tanenbaum A. S., Van Steen M., — Distributed Systems: Principles and Paradigms, Pearson Education, 2007.
4. Liu M. L., — Distributed Computing, Principles and Applications, Pearson Education, 2004.
5. Nancy A Lynch, — Distributed Algorithms, Morgan Kaufman Publishers, USA, 2003.

OBJECTIVES:

- To be familiar with Web page design using HTML/XML and stylesheets
- To be exposed to creation of user interfaces using Java frames and applets.
- To learn to create dynamic web pages using server side scripting.
- To learn to write Client Server applications.
- To be familiar with the PHP programming.
- To be exposed to creating applications with AJAX

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML
 - a. To embed a map in a web page
 - b. To fix the hotspots in that map
 - c. Show all the related information when the hotspots are clicked.
2. Create a web page with the following.
 - a. Cascading stylesheets.
 - b. Embedded stylesheets.
 - c. Inline stylesheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Write programs in Java using Servlets:
 - i. To invoke servlets from HTML forms
 - ii. Session tracking using hidden form fields and Session tracking for a hit count
5. Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student marklist. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT webserver. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogues should be dynamically loaded from the database.
8. Create and save an XML document at the server, which contains 10 users information.
 5. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
 6. i. Validate the form using PHP regular expression. ii. PHP stores a form data into database.
 7. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Construct Web pages using HTML/XML and stylesheets.
- Build dynamic web pages with validation using JavaScript objects and by applying different event handling mechanisms.
- Develop dynamic web pages using server side scripting.
- Use PHP programming to develop web applications.
- Construct web applications using AJAX and web services.

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**MOBILE APPLICATION DEVELOPMENT
LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop an application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project)

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Develop mobile applications using GUI and Layouts.
- Develop mobile applications using Event Listener.
- Develop mobile applications using Databases.
- Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS.
- Analyze and discover own mobile app for simple needs.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

20150LPC	PROFESSIONAL COMMUNICATION	L	T	P	C
		3	1	0	4

OBJECTIVES:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I 9

Introduction to Soft Skills--Hard skills & soft skills-employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II 9

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III 9

Introduction to Group Discussion—Participating in group discussions—understanding group dynamics -brainstorming the topic—questioning and clarifying—GD strategies-activities to improve GD skills

UNIT IV 9

Interview etiquette–dress code–body language–attending job interviews–telephone/skype interview- one to one interview & panel interview – FAQs related to job interviews

UNIT V 9

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Make effective presentations
- participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

RECOMMENDED SOFTWARE

1. JGlobe arena
2. Win English.

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2016.
3. Interact English Lab Manual for Undergraduate Students, .Orient Blackswan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharan et al. Soft Skills. MJ Publishers: Chennai, 2010.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING**9**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING**9**

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management

UNIT IV DIRECTING**9**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication communication and IT.

9**UNIT V CONTROLLING**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, — Management, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. J. A. F. Stoner, Freeman R. E. and Daniel R. Gilbert — Management, Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, — Fundamentals of Management, Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, — Management, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich — Essentials of Management, Tata McGraw Hill, 1998.
4. Tripathy P. C. & Reddy P. N., — Principles of Management, Tata McGraw Hill, 1999

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security - Security attacks, services and mechanisms - OS security architecture - Classical encryption techniques: substitution techniques, transposition techniques, steganography - Foundations of modern cryptography: perfect security - information theory - product cryptosystem - cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic - Euclid's algorithm - Congruence and matrices - Groups, Rings, Fields - Finite fields - SYMMETRIC KEY CIPHERS: DES - Block cipher Principles of DES - Strength of DES - Differential and linear cryptanalysis - Block cipher design principles - Block cipher mode of operation - Evaluation criteria for AES - Advanced Encryption Standard - RC4 - Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes - Primality Testing - Factorization - Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem - Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem - Key distribution - Key management - Diffie-Hellman key exchange - ElGamal cryptosystem - Elliptic curve arithmetic - Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement - Authentication function - MAC - Hash function - Security of hash function and MAC - SHA - Digital signature and authentication protocols - DSS - Entity Authentication: Biometrics, Passwords, Challenge Response protocols - Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security - PGP, S/MIME - IP security - Web Security - SYSTEM SECURITY: Intruders - Malicious software - viruses - Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the fundamentals of network security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operations of public key cryptography
- Apply the various Authentication schemes to simulated different applications.
- Understand various Security practices and System security standards

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

TEXTBOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES:

1. CK Shyamala, N Harini and Dr. TR Padmanabhan: Cryptography and Network Security, Wiley India Pvt. Ltd

2. Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw Hill 2007

3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

OBJECTIVES:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION

9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II CLOUD ENABLING TECHNOLOGIES

9

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE

9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD

9

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS

9

Hadoop – MapReduce – Virtual Box – Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXTBOOKS:

- 1 KaiHwang, GeoffreyC.Fox, JackG.Dongarra, "DistributedandCloudComputing, FromParallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, JohnW., and JamesF.Ransome, —CloudComputing: Implementation, Management and Security, CRC Press, 2017.

REFERENCES:

- 1 RajkumarBuyya, ChristianVecchiola, S.ThamaraiSelvi, —MasteringCloudComputing, TataMcgraw Hill, 2013.
2. TobyVelte, AnthonyVelte, RobertElsenpeter, "CloudComputing- APracticalApproach, TataMcgraw Hill, 2009.
3. GeorgeReese, "CloudApplicationArchitectures: BuildingApplicationsandInfrastructureintheCloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

OBJECTIVES:

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

LIST OF EXPERIMENTS

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows 7 or 8.
2. Install a C compiler in the virtual machine created using virtualbox and execute Simple Programs
3. Install Google App Engine. Create hello world app and others simple web applications using python/ java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Configure various virtualization tools such as VirtualBox, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement news schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large datasets in a parallel environment.

OBJECTIVES:

- To learn different cipher techniques
- To implement the algorithms DES, RSA, MD5, SHA-1
- To use network security tools and vulnerability assessment tools

LIST OF EXPERIMENTS

1. Perform encryption, decryption using the following substitution techniques
(i) Caesar cipher, (ii) playfair cipher, (iii) Hill Cipher, (iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques
(i) Rail fence, (ii) row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implement RSA algorithm using HTML and JavaScript
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME-Digital Signature Standard.
9. Demonstrate intrusion detection system (IDS) using any tool e.g. Snort or any others/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware
i) Building Trojan, ii) Rootkit Hunter

TOTAL: 60 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Develop code for classical Encryption Techniques to solve the problems.
- Build crypto systems by applying symmetric and public key encryption algorithms.
- Construct code for authentication algorithms.
- Develop a signature scheme using Digital signature standard.
- Demonstrate the network security system using open source tools

-LIST OF ELECTIVES-

20150E66A	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) **9**

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT II DATA MINING – INTRODUCTION **9**

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications - Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III DATA MINING – FREQUENT PATTERN ANALYSIS **9**

Mining Frequent Patterns, Associations and Correlations – Mining Methods - Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING **9**

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Lazy Learners – Model Evaluation and Selection - Techniques to improve Classification Accuracy.

Clustering Techniques – Cluster analysis - Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data - Clustering with constraints, Outlier analysis - outlier detection methods.

UNIT V WEKA TOOL **9**

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association – rule learners.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Design a Data warehouse system and perform business analysis with OLAP tools.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

- Applies suitable pre-processing and visualization techniques for data analysis

- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis

TEXTBOOKS:

1. Jiawei Han and Micheline Kamber, — Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCES:

1. Alex Berson and Stephen J. Smith, — Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, — Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H. Witten and Eibe Frank, — Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

OBJECTIVES:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management and test automation techniques.
- To apply test metrics and measurements.

UNIT I INTRODUCTION

9

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT II TEST CASE DESIGN STRATEGIES

9

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White box testing approaches – Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING

9

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT

9

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program.

UNIT V TEST AUTOMATION

9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Design test cases suitable for software development for different domains.
- Identify suitable tests to be carried out.
- Prepare test planning based on the document.
- Document test plans and test cases designed.
- Use automatic testing tools.
- Develop and validate a test plan.

TEXTBOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, — Software Testing - Principles and Practices, Pearson Education, 2006.
2. Ron Patton, — Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com

REFERENCES:

1. Ilene Burnstein, — Practical Software Testing, Springer International Edition, 2003.
2. Edward Kit, — Software Testing in the Real World - Improving the Process, Pearson Education, 1995.
3. Boris Beizer, — Software Testing Techniques - 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, — Foundations of Software Testing - Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

OBJECTIVES:

- To learn the architecture and programming of ARM processor.
- To become familiar with the embedded computing platform design and analysis.
- To get thorough knowledge in interfacing concepts
- To design an embedded system and to develop programs.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM**9****PROCESSORS**

Complex systems and micro processors – Embedded system design process – Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption..

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN**9**

The CPU Bus- Memory devices and systems – Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs – Model of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size – Program validation and testing.

UNIT III SENSOR INTERFACING WITH ARDUINO**9**

Basics of hardware design and functions of basic passive components – sensors and actuators – Arduino code – library file for sensor interfacing – construction of basic applications

UNIT IV EMBEDDED FIRMWARE**9**

Reset Circuit, Brown-out Protection Circuit – Oscillator Unit – Real Time Clock – Watchdog Timer – Embedded Firmware Design Approaches and Development Languages.

UNIT V EMBEDDED C PROGRAMMING**9**

Introduction – Creating ‘hardware delays’ using Timer0 and Timer1 – Reading switches – Adding structure to the code – Generating a minimum and maximum delay – Example: Creating a portable hardware delay – Timeout mechanisms – Creating loop timeouts – Testing loop timeouts – hardware timeouts – Testing a hardware timeout

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Describe the architecture and programming of ARM processor.
- Explain the concepts of embedded systems
- Understand the Concepts of peripherals and interfacing of sensors.
- Capable of using the system design techniques to develop firmware
- Illustrate the code for constructing a system

TEXTBOOKS:

1. Marilyn Wolf, —Computers as Components-Principles of Embedded Computing System
2. Design, Third Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (unit I & II)
3. <https://www.coursera.org/learn/interface-with-arduino#syllabus> (Unit III)
4. Michael J. Pont, —Embedded C++, 2nd Edition, Pearson Education, 2008. (Unit IV & V)

REFERENCES:

1. Shibu K. V, —Introduction to Embedded Systems, McGraw Hill, 2014
2. Jonathan W. Valvano, —Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012
3. Raj Kamal, —Embedded Systems- Architecture, programming and design, 3rd edition, TMH, 2015
4. Lyla, —Embedded Systems, Pearson, 2013
5. David E. Simon, —An Embedded Software Primer, Pearson Education, 2000.

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I **9**

Introduction-Graph Terminologies-Types of Graphs-Sub Graph-Multi Graph-Regular Graph-Isomorphism - Isomorphic Graphs -Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II **9**

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration- Labeled Tree - Unlabeled Tree -Spanning Tree -Fundamental Circuits-Cut Sets-Properties-Fundamental Circuit and Cut-set-Connectivity- Separability-Related Theorems.

UNIT III **9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph- Geometric and Combinatorial Dual -Related Theorems - Digraph - Properties - Euler Digraph.

9

UNIT IV

Matrix Representation -Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial-Chromatic Partitioning -Matching- Covering - Related Theorems.

UNIT V **9**

Graph Algorithms-Connectedness and Components-Spanning Tree-Fundamental Circuits-Cut Vertices-Directed Circuits- Shortest Path - Applications overview.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

TEXTBOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds, "Graph Theory Applications", Springer, 2016.

REFERENCES:

1. Bondy, J.A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication, 2008.
2. West, D.B.,—Introduction to Graph Theory, Pearson Education, 2011.
3. John Clark, Derek Allan Holton,—A First Look at Graph Theory, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer, 3rd Edition, 2006.

5. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2007.

OBJECTIVES:

- To understand the basics of discrete time signals, systems and their classifications.
- To analyze the discrete time signals in both time and frequency domain.
- To design low pass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
- To design Linear phase digital FIR filters using Fourier method, window technique
- To realize the concept and usage of DSP in various engineering fields.

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 9

Introduction to DSP – Basic elements of DSP– Sampling of Continuous time signals– Representation, Operation and Classification of Discrete Time Signal– Classification of Discrete Time Systems– Discrete Convolution: Linear and Circular– Correlation

UNIT II ANALYSIS OF LTIDISCRETE TIME SIGNALS AND SYSTEMS 9

Analysis of LTIDiscrete Time Systems using DFT– Properties of DFT– Inverse DFT– Analysis of LTIDiscrete Time Systems using FFT Algorithms– Inverse DFT using FFT Algorithm.

UNIT III INFINITE IMPULSE RESPONSE FILTERS 9

Frequency response of Analog and Digital IIR filters– Realization of IIR filter– Design of analog low pass filter– Analog to Digital filter Transformation using Bilinear Transformation and Impulse Invariant method– Design of digital IIR filters (LPF, HPF, BPF, and BRF) using various transformation techniques.

UNIT IV FINITE IMPULSE RESPONSE FILTERS 9

Linear Phase FIR filter– Phase delay– Group delay– Realization of FIR filter– Design of Causal and Non-causal FIR filters (LPF, HPF, BPF and BRF) using Window method (Rectangular, Hamming window, Hanning window)– Frequency Sampling Technique.

UNIT V APPLICATIONS OF DSP 9

Multirate Signal Processing: Decimation, Interpolation, Spectrum of the sampled signal– Processing of Audio and Radar signal.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Perform mathematical operations on signals.
- Understand the sampling theorem and perform sampling on continuous-time signals to get discrete time signal by applying advanced knowledge of the sampling theory.
- Transform the time domain signal into frequency domain signal and vice-versa.
- Apply the relevant theoretical knowledge to design the digital IIR/FIR filters for the given analog specifications.

TEXTBOOKS:

1. John G. Proakis & Dimitris G. Manolakis, — Digital Signal Processing— Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES:

1. Richard G. Lyons, — Understanding Digital Signal Processing, Second Edition, Pearson Education.

2. A.V.Oppenheim,R.W.SchaferandJ.R.Buck,—Discrete-TimeSignalProcessingI,8thIndianReprint, Pearson, 2004.
3. EmmanuelC.Ifeakor,&Barrie.W.Jervis,—DigitalSignalProcessingI,SecondEdition,PearsonEducation / Prentice Hall, 2002.
4. WilliamD.Stanley,—DigitalSignalProcessingI,SecondEdition,RestonPublications.

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data

UNIT I INTRODUCTION TO BIG DATA

9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics – Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value - Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

9

UNIT II CLUSTERING AND CLASSIFICATION

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions - Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes' Theorem - Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM

9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association & finding similarity - Recommendation System: Collaborative Recommendation - Content Based Recommendation - Knowledge Based Recommendation - Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY

9

Introduction to Streams Concepts - Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream - Filtering Streams - Counting Distinct Elements in a Stream - Estimating moments - Counting oneness in a Window - Decaying Window - Realtime Analytics Platform (RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

9

NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation - Key Value Stores - Document Stores - Tabular Stores - Object Data Stores - Graph Databases - Hive - Sharding - Hbase - Analyzing big data with twitter - Big data for E-Commerce - Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large data
- Perform analytics on data streams
- Learn NoSQL databases and management.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

TEXTBOOKS:

Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.

REFERENCES:

EMCEducation Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.

3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.

4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers" CRC Press, 2015.

5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

OBJECTIVES:

- To understand the need for machine learning for various problems solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problems solving

UNIT I INTRODUCTION 9

Introduction-Graph Terminologies-Types of Graphs-Sub Graph-Multi Graph-Regular Graph-Isomorphism - Isomorphic Graphs -Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II NEURAL NETWORKS AND GENETICAL ALGORITHMS 9

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration - Labelled Tree - Unlabelled Tree -Spanning Tree -Fundamental Circuits-Cut Sets-Properties-Fundamental Circuit and Cut-set-Connectivity -Separability - Related Theorems.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual -Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV INSTANT BASED LEARNING 9

Matrix Representation -Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning -Matching- Covering - Related Theorems.

UNIT V ADVANCED LEARNING 9

Graph Algorithms-Connectedness and Components-Spanning Tree-Fundamental Circuits-Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL:45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Discuss the decision tree algorithm and identify and overcome the problem of overfitting
- Discuss and apply the backpropagation algorithm and genetic algorithm to various problems
- Apply the Bayesian concept to machine learning
- Analyse and suggest appropriate machine learning approaches for various types of problems

TEXTBOOKS:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

OBJECTIVES:

- TounderstandtheSoftwareProjectPlanningandEvaluationtechniques.
- Toplanandmanageprojectsateachstageofthesoftwaredevelopment lifecycle(SDLC).
- Tolearnabouttheactivityplanningandriskmanagementprinciples.
- Tomanagesoftwareprojectsandcontrolsoftwaredeliverables.
- Todevelopskillstomanagethevariousphasesinvolvedinproject managementandpeoplemanagement.
- Todeliversuccessfulsoftwareprojectsthat supportorganization'sstrategicgoals.

UNIT I PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II PROJECT LIFECYCLE AND EFFORT ESTIMATION 9

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT IV PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT V STAFFING IN SOFTWARE PROJECTS 9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.

- Estimate the risks involved in various project activities.

- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

TEXTBOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki—Effective Software Project Management—Wiley Publication, 2011.
2. Walker Royce:—Software Project Management—Addison-Wesley, 1998.
3. Gopalaswamy Ramesh,—Managing Global Software Projects—McGraw Hill Education
(India), Fourteenth Reprint 2013.

OBJECTIVES:

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF IoT 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II IOT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – NoSQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plant wide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Explain the concept of IoT
- Analyze various protocols for IoT
- Design a PoC of an IoT system using Raspberry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT
- Analyze applications of IoT in real-time scenarios

TEXTBOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things—A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things—Key applications and protocols, Wiley, 2012 (for Unit 2)
3. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011
6. <https://www.arduino.cc/>
7. https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

OBJECTIVES:

- TolearnfundamentalsofXML
- ToprovideanoverviewofServiceOrientedArchitectureandWebservicesandtheir importance
- Tolearnwebservicesstandardsandtechnologies
- Tolearnserviceorientedanalysisanddesignfor developingSOAbasedapplications

UNIT I XML 9

XML document structure – Well-formed and valid documents – DTD–XMLSchema – ParsingXMLusing DOM, SAX – XPath - XML Transformation and XSL – Xquery

UNIT II SERVICEORIENTEDARCHITECTURE(SOA)BASICS 9

Characteristics ofSOA, BenefitsofSOA, ComparingSOAwithClient-Server andDistributedarchitectures --- Principles of Service Orientation – Service layers

UNIT III WEBSERVICES(W S)ANDSTANDARDS 8

WebServices Platform–Servicedescriptions –WSDL–MessagingwithSOAP –Servicediscovery–UDDI – Service-Level Interaction Patterns – Orchestration and Choreography

UNIT IV WEBSERVICESEXTENSIONS 8

WS-Addressing - WS-ReliableMessaging - WS-Policy – WS-Coordination – WS-Transactions-WS-Security - Examples

UNIT V SERVICEORIENTEDANALYSISANDDESIGN 11

SOAdeliverystrategies–Serviceorientedanalysis–ServiceModelling–Serviceorienteddesign–Standards and composition guidelines -- Service design – Business process design – CaseStudy

TOTAL:45PERIODS

OUTCOMES:

Attheendofthecourse,thestudentsshouldbeableto:

- UnderstandXMLtechnologies
- Understandserviceorientation,benefitsofSOA
- UnderstandwebservicesandWSstandards
- Usewebservicesextensionstodevelopsolutions
- Understandandapplyservicemodelling,serviceorientedanalysisanddesignforapplicationdevelopment

TEXTBOOKS:

1. ThomasErl,—ServiceOrientedArchitecture:Concepts,Technology,andDesignI,PearsonEducation, 2005
2. SandeepChatterjeeandJamesWebber,—DevelopingEnterpriseWebServices:AnArchitect's Guidel, Prentice Hall, 2004

REFERENCES:

1. JamesMcGovern,SameerTyagi,MichaelEStevens,SunilMathew,—JavaWebServicesArchitecture, Elsevier, 2003.
2. RonSchmelzeretal.—XMLandWebServicesI,PearsonEducation,2002.
3. FrankP.Coyle,—XML,WebServicesandtheDataRevolutionI,PearsonEducation,2002

20150E76A MULTI-CORE ARCHITECTURES AND PROGRAMMING

L T P C

3 0 0 3

OBJECTIVES:

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms,
- To develop multi-core programs and design parallel solutions

UNIT I MULTI-CORE PROCESSORS 9

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.

UNIT II PARALLEL PROGRAM CHALLENGES 9

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP 9

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI 9

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived data types – Performance evaluation

UNIT V PARALLEL PROGRAM DEVELOPMENT 9

Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and Comparison.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Describe multi-core architectures and identify their characteristics and challenges.
- Identify the issues in programming Parallel Processors.
- Write programs using OpenMP and MPI.
- Design parallel programming solutions to common problems.
- Compare and contrast programming for serial processors and parallel processors.

TEXTBOOKS:

1. Peter S. Pacheco, — An Introduction to Parallel Programming, Morgan-Kaufman/Elsevier, 2011.
2. Darryl Gove, — Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011 (unit 2)

REFERENCES:

1. Michael J Quinn, — Parallel programming in C with MPI and OpenMP, Tata McGraw Hill, 2003.
2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

20150E76B	HUMANCOMPUTERINTERACTION	L	T	P	C
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OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I FOUNDATIONSOFHCI 9

The Human: I/O channels– Memory – Reasoning and problem solving; The Computer: Devices–Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN&SOFTWAREPROCESS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks–Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks–Application Transport Methods: Supervisory Control and Data Acquisition –Application Layer Protocols: CoAP and MQTT

UNIT III MODELSANDTHEORIES 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV MOBILE HCI 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest– Role of Machine Learning– NoSQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics– Xively Cloud for IoT, Python Web Application Framework – Django –AWS for IoT – System Management with NETCONF-YANG

UNIT V WEBINTERFACEDESIGN 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL:45PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Explain the HCI implications for designing multimedia/e-commerce/e-learning Websites.
- Develop meaningful user interface.

TEXTBOOKS:

1. Alan Dix, Janet Finlay, Gregory A. Bowerd, Russell Beale, —Human Computer Interaction I, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, —Mobile Design and Development I, First Edition, O’Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, —Designing Web Interfaces I, First Edition, O’Reilly, 2009. (UNIT -V)

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

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OBJECTIVES:

- To learn basic programming in C# and the object-oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.
- To study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5
- To implement mobile applications using .Net compact framework
- To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT I C# LANGUAGE BASICS 9

.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types - Classes and Structs - Inheritance - Generics - Arrays and Tuples - Operators and Casts - Indexers

UNIT II IOT PROTOCOLS 9

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection

UNIT III DESIGN AND DEVELOPMENT 9

Diagnostics - Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML - SAX and DOM - Manipulating files and the Registry - Transactions - ADO.NET - Peer-to-Peer Networking - P2P - Building P2P Applications - Windows Presentation Foundation (WPF).

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Window based applications - Core ASP.NET - ASP.NET Web forms - Windows Communication Foundation (WCF) - Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities - Workflows

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - App domains - Core XAML - Bubbling and Tunneling Events - Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores - Errors, Testing and Debugging - Optimizing performance - Packaging and Deployment - Networking and Mobile Devices

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Write various applications using C# Language in the .NET Framework.
- Develop distributed applications using .NET Framework.
- Create mobile applications using .NET compact Framework.

TEXTBOOKS:

1. Christian Nagel, Bille Vjen, Jay Glynn, Karli Watson, Morgan Skinner. — Professional C# 2012 and .NET 4.5!, Wiley, 2012
2. Harsh Bhasin. — Programming in C#, Oxford University Press, 2014.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

REFERENCES:

1. IanGariffiths,MathewAdams,JesseLiberty,—ProgrammingC#4.0!,O_Reilly,Fourth Edition, 2010.
2. AndrewTroelsen,ProC#5.0andthe.NET4.5Framework,Apresspublication,2012
3. AndyWigley,DanielMoth,PeterFoot,—MobileDevelopmentHandbook!,MicrosoftPress,2011.

OBJECTIVES:

- To learn about the issues and challenges in the design of wireless adhoc networks.
- To understand the working of MAC and Routing Protocols for adhoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for adhoc and sensor networks.
- To understand various security issues in adhoc and sensor networks and the corresponding solution

UNIT I MAC & ROUTING IN ADHOC NETWORKS 9

Introduction – Issues and challenges in adhoc networks – MAC Layer Protocols for wireless adhoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple-Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Adhoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols

UNIT II TRANSPORT & QOS IN ADHOC NETWORKS 9

TCP’s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT III MAC & ROUTING IN WIRELESS SENSOR NETWORKS 9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples

UNIT V SECURITY IN ADHOC AND SENSOR NETWORKS 9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Identify different issues in wireless adhoc and sensor networks
- To analyze protocols developed for adhoc and sensor networks
- To identify and understand security issues in adhoc and sensor networks.

TEXTBOOKS:

1. C.SivaRamMurthyandB.S.Manoj,—AdHocWirelessNetworks—Architecturesand2Protocolsl, Pearson Education, 2006.
2. HolgerKarl,AndreasWilling,—ProtocolsandArchitecturesforWirelessSensorNetworksl,John Wiley & Sons, Inc., 2005.

REFERENCES:

1. SubirKumarSarkar,TGBasavaraju,CPuttamadappa,—AdHocMobileWirelessNetworksAuerbach Publications, 2008.
2. CarlosDeMoraisCordeiro,DharmaPrakashAgrawal,—AdHocandSensorNetworks:Theory and Applications (2nd Edition)l, World Scientific Publishing, 2011.
3. Waltenegus Dargie, Christian Poellabauer, —Fundamentals of Wireless SensorNetworks Theory and Practicel, John Wiley and Sons, 2010.
4. Xiang-YangLi,“Wireless AdHocandSensor Networks:Theory andApplicationsl, 1227thedition, Cambridge university Press,2008.

OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and their applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of advanced data models.
- To learn emerging databases such as XML, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

UNIT I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III INTELLIGENT DATABASES 9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2) – Taxonomy – Applications – Design Principles for Active Rules – Temporal Databases: Overview of Temporal Databases – TSQ2 – Deductive Databases: Logic of Query Languages – Datalog – Recursive Rules – Syntax and Semantics of Datalog Languages – Implementation of Rules and Recursion – Recursive Queries in SQL – Spatial Databases – Spatial Data Types – Spatial Relationships – Spatial Data Structures – Spatial Access Methods – Spatial DB Implementation.

UNIT IV ADVANCED DATA MODELS 9

Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models – Concurrency Control – Transaction Commit Protocols – Multimedia Databases – Information Retrieval – Data Warehousing – Data Mining – Text Mining

UNIT V EMERGING TECHNOLOGIES 9

XML Databases: XML-Related Technologies – XML Schema – XML Query Languages – Storing XML in Databases – XML and SQL – Native XML Databases – Web Databases – Geographic Information Systems – Biological Data Management – Cloud Based Databases: Data Storage Systems on the Cloud – Cloud Storage Architectures – Cloud Data Models – Query Languages – Introduction to Big Data – Storage – Analysis

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- To develop in depth understanding of relational databases and skills to optimize database performance in practice.
- To understand and critique one each type of databases.
- To design faster algorithms in solving practical database problems.
- To implement intelligent databases and various data models.

TEXTBOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, — Fundamentals of Database Systems, Sixth Edition Pearson, 2011.
2. Thomas Cannolly and Carolyn Begg, — Database Systems, A Practical Approach to Design, Implementation and Management, Fourth Edition, Pearson Education, 2008.

REFERENCES:

1. Henry F. Korth, Abraham Silberschatz, S. Sudharshan, — Database System Concepts, Sixth Edition, McGraw Hill, 2011.
2. C. J. Date, A. Kannan, S. Swamynathan, — An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V. S. Subrahmanian, Roberto Zicari, — Advanced Database Systems, Morgan Kaufmann publishers, 2006.

OBJECTIVES:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters– Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration -degradation model, Properties, Noise models– Mean Filters– Order Statistics– Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture-Patterns and Pattern classes - Recognition based on matching.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate images using the techniques of smoothing, sharpening and enhancement.
- Understand the restoration concepts and filtering techniques.
- Learn the basics of segmentation, feature extraction, compression and recognition methods for color models.

TEXTBOOKS:

1. RafaelC.Gonzalez,RichardE. Woods,_DigitalImageProcessing',Pearson,ThirdEdition,2010.
2. AnilK.Jain,_FundamentalsofDigitalImageProcessing',Pearson,2002.

REFERENCES:

1. KennethR.Castleman,_DigitalImageProcessing',Pearson,2006.
2. RafaelC.Gonzalez,RichardE. Woods,StevenEddins,_DigitalImageProcessingusingMATLAB', Pearson Education, Inc., 2011.
3. D.E.DudgeonandRM.Mersereau,_MultidimensionalDigitalSignalProcessing',PrenticeHall Professional Technical Reference, 1990.
4. WilliamK.Pratt,_DigitalImageProcessing',JohnWiley,NewYork,2002
5. MilanSonkaetal_ Imageprocessing,analysisandmachinevision',Brookes/Cole,VikasPublishing House, 2nd edition, 1999

SOCIAL NETWORK ANALYSIS

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- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

UNIT I INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 9

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL: 45 PERIODS

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OUTCOMES:

At the end of the course, the students should be able to:

- Develop semantic web related applications.
- Represent knowledge using ontology
- Predict human behaviour in social web and related communities.
- Visualize social networks

TEXTBOOKS:

1. Peter Mika, — Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, — Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

REFERENCES:

1. Guandong Xu, Yanchun Zhang and Lin Li, — Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, — Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, — Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, — The Social Semantic Web, Springer, 2009.

OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT I INTRODUCTION

9

History, What is Information Security?, Critical Characteristics of Information, NIST ISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION

9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy - Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT III SECURITY ANALYSIS

9

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem

UNIT IV LOGICAL DESIGN

9

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN

9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Discuss the basics of information security
- Illustrate the legal, ethical and professional issues in information security
- Demonstrate the aspects of risk management
- Become aware of various standards in the Information Security System
- Design and implementation of Security Techniques

TEXTBOOKS:

1. Michael E Whitman and Herbert J Mattord, — Principles of Information Security, Vikas Publishing House, New Delhi, 2003

REFERENCES:

1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, — Hacking Exposed, Tata McGraw-Hill, 2003
3. Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2002.

OBJECTIVES:

- To learn computer forensics
- To become familiar with forensic tools
- To learn to analyze and validate forensic data.

UNIT I INTRODUCTION TO COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime. Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response toolkit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II EVIDENCE COLLECTION AND FORENSIC TOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools

UNIT III ANALYSIS AND VALIDATION 9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV ETHICAL HACKING 9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing.

UNIT V ETHICAL HACKING IN WEB 9

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers – Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand the basics of computer forensics
- Apply a number of different computer forensic tools to a given scenario
- Analyze and validate forensic data
- Identify the vulnerabilities in a given network infrastructure
- Implement real-world hacking techniques to test system security.

TEXTBOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Stuart,—Computer Forensics and Investigations I, Cengage Learning, India Edition, 2016.
2. CEH Official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCES:

1. John R. Vacca,—Computer Forensics I, Cengage Learning, 2005
2. Marjie T. Britz,—Computer Forensics and Cyber Crime: An Introduction I, 3rd Edition, Prentice Hall, 2013.
3. Ankit Fadia—Ethical Hacking I Second Edition, Macmillan India Ltd, 2006
4. Kenneth C. Brancik—Insider Computer Fraud I Auerbach Publications Taylor & Francis Group—2008

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Backpropagation Neural Networks-Kohonen Neural Network-Learning Vector Quantization-Hamming Neural Network-Hopfield Neural Network-Bi-directional Associative Memory-Adaptive Resonance Theory Neural Networks-Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS 9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV GENETICALGORITHMS 9

Basic Concepts-Working Principles-Encoding-Fitness Function-Reproduction-Inheritance Operators-Cross Over-Inversion and Deletion-Mutation Operator- Bit-wise Operators-Convergence of Genetic Algorithm.

UNIT V HYBRID SYSTEMS 9

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination- LR-Type Fuzzy Numbers-Fuzzy Neuron-Fuzzy BP Architecture-Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy Art Map: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Apply suitable soft computing techniques for various applications.
- Integrate various soft computing techniques for complex problems.

TEXTBOOKS:

1. N.P.Padhy,S.P.Simon,"SoftComputingwithMATLABProgramming",OxfordUniversity Press, 2015.
2. S.N.Sivanandam,S.N.Deepa,"PrinciplesofSoftComputing",WileyIndiaPvt.Ltd.,2nd Edition, 2011.
3. S.Rajasekaran,G.A.VijayalakshmiPai,"NeuralNetworks,FuzzyLogicandGeneticAlgorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

REFERENCES:

1. Jyh-ShingRogerJang,Chuen-TsaiSun,EijiMizutani,—Neuro-FuzzyandSoftComputing, Prentice-Hall of India, 2002.
2. KwangH.Lee,—FirstcourseonFuzzyTheoryandApplications, Springer, 2005.
3. GeorgeJ.KlirandBoYuan,—FuzzySetsandFuzzyLogic-TheoryandApplications, Prentice Hall, 1996.
4. JamesA.FreemanandDavidM.Skapura,—NeuralNetworksAlgorithms,Applications,andProgramming Techniques, Addison Wesley, 2003.

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OBJECTIVES:

- TounderstandthebasicsofInformationRetrieval.
- Tounderstandmachinelearningtechniquesfortextclassificationandclustering.
- Tounderstandvarioussearchenginesystemoperations.
- Tolearndifferenttechniquesofrecommendersystem.

UNITI INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The User_s Task – Information versusDataRetrieval - The IR System – The Software Architecture of the IR System – The Retrieval andRanking Processes- The Web – The e-Publishing Era – How the web changed Search – PracticalIssuesonthe Web– How PeopleSearch–SearchInterfaces Today – Visualization in Search Interfaces.

UNITII MODELINGANDRETRIEVAL EVALUATION 9

BasicIRModels-BooleanModel-TF-IDF(TermFrequency/InverseDocumentFrequency)Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural NetworkModel – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-basedEvaluation– RelevanceFeedbackandQueryExpansion–Explicit Relevance Feedback.

UNITIII TEXTCLASSIFICATIONANDCLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve TextClassification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – FeatureSelection or Dimensionality Reduction –Evaluationmetrics – Accuracy and Error – Organizing theclasses – Indexing and Searching – Inverted Indexes – Sequential Searching–Multi-dimensionalIndexing.

UNITIV WEBRETRIEVALANDWEBCRAWLING 9

TheWeb – Search Engine Architectures – Cluster based Architecture – Distributed Architectures– SearchEngineRanking–LinkbasedRanking–SimpleRankingFunctions – LearningtoRank– Evaluations --SearchEngineRanking– SearchEngineUser Interaction–Browsing– ApplicationsofaWebCrawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNITV RECOMMENDERSYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – RecommendationTechniques–BasicsofContent-basedRecommenderSystems– HighLevelArchitecture–Advantagesand Drawbacksof Content-based Filtering– Collaborative Filtering –Matrixfactorization models – Neighborhood models..

TOTAL:45PERIODS

OUTCOMES:

Attheendofthecourse,thestudentsshouldbeableto:

- Useanopensourcearchengineframeworkandexploreitscapabilities
- Applyappropriatemethodofclassificationorclustering.
- Designandimplementinnovativefeaturesinasearchengine.
- Designandimplementarecommendersystem.

SKILLDEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

TEXTBOOKS:

SKILLDEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F., Rokach, L., Shapira, B., Kantor, B., —Recommender Systems Handbook, First Edition, 2011.

REFERENCES:

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

UNIT I INTRODUCTION 9

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS 10

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES 8

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- To tag a given text with basic language features
- To design an innovative application using NLP components
- To implement a rule-based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXTBOOKS:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper,—Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin,—Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese,—Natural Language Processing with Java, O'Reilly Media, 2015.
3. Nitin Indurkha and Fred J. Damerau,—Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary,—Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

OBJECTIVES:

- To understand different parallel architectures and models of computation.
- To introduce the various classes of parallel algorithms.
- To study parallel algorithms for basic problems.

UNIT I INTRODUCTION 9

Need for Parallel Processing - Data and Temporal Parallelism - Models of Computation - RAM and PRAM Model – Shared Memory and Message Passing Models- Processor Organisations - PRAM Algorithm – Analysis of PRAM Algorithms- Parallel Programming Languages.

UNIT II PRAM ALGORITHMS 9

Parallel Algorithms for Reduction – Prefix Sum – List Ranking – Preorder Tree Traversal – Searching – Sorting – Merging Two Sorted Lists – Matrix Multiplication - Graph Coloring - Graph Searching.

UNIT III SIMD ALGORITHMS-I 9

2D Mesh SIMD Model - Parallel Algorithms for Reduction - Prefix Computation - Selection - Odd-Even Merge Sorting - Matrix Multiplication.

UNIT IV SIMD ALGORITHMS-II 9

Hypercube SIMD Model - Parallel Algorithms for Selection- Odd-Even Merge Sort- Bitonic Sort- Matrix Multiplication Shuffle Exchange SIMD Model - Parallel Algorithms for Reduction - Bitonic Merge Sort - Matrix Multiplication - Minimum Cost Spanning Tree

UNIT V MIMD ALGORITHMS 9

UMA Multiprocessor Model - Parallel Summing on Multiprocessor - Matrix Multiplication on Multiprocessors and Multicomputer - Parallel Quick Sort - Mapping Data to Processors.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Develop parallel algorithms for standard problems and applications.
- Analyse efficiency of different parallel algorithms.

TEXT BOOKS:

1. Michael J. Quinn, "Parallel Computing: Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition, 2011.
3. V. Rajaraman, C. Siva Ram Murthy, "Parallel Computers - Architecture and Programming", PHI learning, 2016.

REFERENCES:

1. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.
2. M. Sasikumar, Dinesh Shikhare and P. Ravi Prakash, "Introduction to Parallel Processing", PHI learning, 2013.
3. S. G. Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

OBJECTIVES:

- To understand the fundamentals of the speech processing
- Explore the various speech models
- Gather knowledge about the phonetics and pronunciation processing
- Perform wavelet analysis of speech
- To understand the concepts of speech recognition

UNIT I INTRODUCTION 9

Introduction-knowledge in speech and language processing-ambiguity-models and algorithms-language - thought - understanding - regular expression and automata - words & transducers – N grams

9

UNIT II SPEECH MODELLING

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model – transformation- based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling.

UNIT III SPEECH PRONUNCIATION AND SIGNAL PROCESSING 9

Phonetics- speech sounds and phonetic transcription- articulatory phonetics- phonological categories and pronunciation variation - acoustic phonetics and signals- phonetic resources-articulatory and gestural phonology

UNIT IV SPEECH IDENTIFICATION 9

Speech synthesis-text normalization-phonetic analysis-prosodic analysis–diphonewaveform synthesis - unit selection waveform synthesis - evaluation

UNIT V SPEECH RECOGNITION 9

Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training - multipass decoding:n-best lists and lattices- a* (_stack) decoding - context-dependent acoustic models: triphones - discriminative training - speech recognition by humans.

TOTAL:45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Create new algorithms with speech processing
- Derive new speech models
- Perform various language phonetic analysis
- Create a new speech identification system
- Generate a new speech recognition system

TEXTBOOKS:

1. Daniel Jurafsky and James H. Martin, — Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition], Person education, 2013.

REFERENCES:

1. Kai-Fu Lee, — Automatic Speech Recognition, The Springer International Series in Engineering and Computer Science, 1999.
2. Himanshu Chaurasiya, — Soft Computing Implementation of Automatic Speech Recognition, LAP Lambert Academic Publishing, 2010.
3. Claudio Becchetti, Klucio Prina Ricotti, — Speech Recognition: Theory and C++ Implementation Wiley publications 2008.
4. Ikrami Eldirawy, Wesam Ashour, — Visual Speech Recognition, Wiley publications, 2011

OBJECTIVE:

- To learn about basis of nanomaterials science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires- ultra-thin films- multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis- Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMB.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis (arc- growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides- ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications- Quantum wires, Quantum dots- preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES

9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS- Nanoindentation.

UNIT V APPLICATIONS

7

Nano Info Tech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechnology: nanoprobe in medical diagnostics and biotechnology, Nanomedicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sun barrier products - In Photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Familiarize about the science of nanomaterials
- Demonstrate the preparation of nanomaterials
- Develop knowledge in characteristic nanomaterial

TEXTBOOKS:

- A.S. Edelstein and R.C. Cammearata, eds., — Nanomaterials: Synthesis, Properties and Applications, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
- N. John Dinardo, — Nanoscale Characterisation of Surfaces & Interfaces, 2nd edition,
- Weinheim Cambridge, Wiley- VCH, 2000

REFERENCES:

- G. Timp, "Nanotechnology", AIP Press/Springer, 1999.
- Akhlesh Lakhtakia, — The Handbook of Nano Technology, Nanometer Structure, Theory,

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

Modeling and Simulations I. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

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CLOUDCOMPUTING

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3 0 0 3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security – Application Security – Virtual Machine Security.

UNIT V CASE STUDIES 9

Google App Engine (GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services (AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXTBOOKS:

1. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley & Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, And Security", CRC Press, 2017.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

- To learn the fundamentals of data models
- To learn conceptual modeling using ER diagrams.
- To study SQL queries and database programming
- To learn proper designing of relational database.
- To understand database security concepts
- To understand Information retrieval techniques

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

Purpose of Database System – Data independence - Data Models – Database System Architecture – Conceptual Data modeling: ER models - Enhanced-ER Model. Introduction to relational databases – Relational Model – Keys – ER-to-Relational Mapping. Modeling of a library management system.

UNIT II DATABASE QUERYING 11

Relational Algebra– SQL: fundamentals – DDL – Specifying integrity constraints-DML – Basic retrieval queries in SQL - Complex SQL retrieval queries – nested queries – correlated queries – joins -aggregate functions. Creating a table, populating data, adding integrity constraints, querying tables with simple and complex queries.

UNIT III DATABASE PROGRAMMING 9

Database programming with function calls, stored procedures - views – triggers. Embedded SQL. ODBC connectivity with front end tools. Implementation using ODBC/JDBC and SQL/PSM, implementing functions, views, and triggers in MySQL / Oracle.

UNIT IV NORMALIZATION AND BRAKE SYSTEMS 9

Functional Dependencies – Design guidelines – Normal Forms: first, second, third – Boyce/Codd Normal Form – Normalization algorithms. Design of a banking database system / university database system.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Database security issues – Discretionary access control – role based access – Encryption and public key infrastructures – challenges. Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- understand relational data model, evolve conceptual model of a given problem, its mapping to relational model and Normalization
- query the relational database and write programs with database connectivity
- understand the concepts of database security and information retrieval systems

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson, 2011.
 2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011

REFERENCES:

1. C.J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
 2. Raghu Ramakrishnan, — Database Management Systems II, Fourth Edition, McGraw-Hill College

OBJECTIVES:

- To study about the different biopotential and its propagation
- To understand the different types of electrodes and its placement for various recording
- To study the design of bio amplifier for various physiological recording -physiological parameters.
- To familiarize the different biochemical measurements.

UNIT I BIOPOTENTIAL GENERATION AND ELECTRODE TYPES 9

Origin of biopotential and its propagation. Types of electrodes - surface, needle and microelectrodes and their equivalent circuits. Recording problems - measurement with two electrodes

UNIT II BIOSIGNAL CHARACTERISTICS AND ELECTRODE CONFIGURATIONS 9

Biosignals characteristics - frequency and amplitude ranges. ECG - Einthoven "triangle", standard 12 lead system. EEG - 10-20 electrode system, unipolar, bipolar and average mode. EMG - unipolar and bipolar mode.

UNIT III SIGNAL CONDITIONING CIRCUITS 9

Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS 10

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, direct methods: electronic manometer, Systolic, diastolic pressure, Blood flow and cardiac output measurement: Indicator dilution, and dye dilution method, ultrasound blood flow measurement.

UNIT V BIO-CHEMICAL MEASUREMENT 8

Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- To Learn the different biopotential and its propagation.
- CO2: To get familiarized with the different electrode placement for various physiological recording
- CO3: Students will be able to design bio amplifier for various physiological recording
- CO4: Students will understand various techniques of non-electrical physiological measurements
- CO5: Understand the different biochemical measurements

TEXTBOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. (Units I, II & V)

REFERENCES:

1. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill Publisher, 2003.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003. (Units II & IV)

3. Joseph J. Carrand John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.

OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communications systems used in mechatronics system development.

UNIT I INTRODUCTION

9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS

9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer, – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS

9

Strain Gage, Load Cell, Magnetic Sensors – types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclometers

9

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

9

UNIT V ALTERNATIVE ENERGY SOURCES

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multichannel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- CO1.** Expertise in various calibration techniques and signal types for sensors.
- CO2.** Apply the various sensors in the Automotive and Mechatronics applications
- CO3.** Study the basic principles of various smart sensors.
- CO4.** Implement the DAQ systems with different sensors for real time applications

TEXTBOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCES:

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

OBJECTIVES:

- To elucidate on advantages of nanotechnology based applications in each industry
- To provide instances of contemporary industrial applications of nanotechnology
- To provide an overview of future technological advancements and increasing role of nanotechnology in each industry

UNIT I NANO ELECTRONICS 9

Advantages of nano electrical and electronic devices – Electronic circuit chips – Lasers - Micro and Nano Electromechanical systems – Sensors, Actuators, Optical switches, - Data memory – Lighting and Displays – Batteries - Fuel cells and Photo-voltaic cells – Electric double layer capacitors – Lead-free solder – Nanoparticle coatings for electrical products.

UNIT II BIONANOTECHNOLOGY 9

Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery – Nanosensors in Diagnosis – Neuro-electronic Interfaces – Therapeutic applications.

UNIT III TRANSMISSION SYSTEMS 9

Nanocatalysts – Smart materials – Heterogeneous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors.

UNIT IV SUSPENSION AND BRAKE SYSTEMS 9

Nanotechnology in Agriculture - Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry

UNIT V ALTERNATIVE ENERGY SOURCES 9

Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application – Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair conditioners

TOTAL: 45 PERIODS**REFERENCES:**

1. Neelina H. Malsch (Ed.), Biomedical Nanotechnology, CRC Press (2005)
2. Udo H. Brinker, Jean-Luc Miesusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems, Wiley Publishers (2010).
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).
4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai, Polymer Nanocomposites, Woodhead publishing, (2006).
7. W. N. Chang, Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

OBJECTIVES:

Understand and analyse the energy data of industries

- Carry out energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

UNIT I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and energy conservation measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing – ESCO concept

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- To analyse the energy data of industries.
- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXTBOOKS:

Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

1. Witte.L.C.,P.S.Schmidt,D.R.Brown,“Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghan,P.W.“Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.
3. Dryden.I.G.C.,“The Efficient Use of Energy” Butterworths, London, 1982
4. Turner.W.C.,“Energy Management Handbook”, Wiley, New York, 1982.
5. Murphy.W.R.and G.McKAY,“Energy Management”, Butterworths, London 1987.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To get exposure on solar radiation and its environmental impact to power.
- To know about the various collectors used for storing solar energy.
- To know about the various applications in solar energy.
- To learn about the wind energy and biomass and its economic aspects.
- To know about geothermal energy with other energy sources.

UNIT I PRINCIPLES OF SOLAR RADIATION 10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION 8

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS 7

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY 10

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria. BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY 9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXTBOOKS:

1. Rai G.D., "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell & Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011

REFERENCES:

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U., "Renewable Energy Technologies", Narosa Publishing House, 2004
3. Mittal K.M., "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P., Singhal, K.C., "Renewable energy sources and emerging technologies", P.H.I, New

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

Automotive engines-External combustion engines-Internal combustion engines -classification of engines-SI Engines- CI Engines- two stroke engines -four stroke engines- construction and working principles - IC engine components-functions and materials -valvetiming-port timing diagram-Injection system-Unit injector system- Rotary distributor type - Electronically controlled injection system for SI engines-CI engines-Ignition system-Electronic ignition system - Transistorized ignition system, capacitive discharge ignition system.

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

Vehicle construction and different chassis layouts-classifications of chassis-types of frames-frameless chassis construction-articulated vehicles- vehicle body- Vehicle aerodynamics-various resistances and its effects -steering system-conventional-sophisticated vehicle- and types of steering gear box-Power Steering- Steering geometry-condition for true rolling motion-Ackermann's-Devi's steering system types of stub axle-Types of rear axles.

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes -manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints -Hotchkiss Drive and Torque Tube Drive- rear axle-Differential-wheels and tyres.

UNIT IV SUSPENSION AND BRAKE SYSTEMS 9

Suspension Systems-conventional Suspension Systems -independent Suspension Systems -leaf spring-coil spring -taper-lite -eligo,s spring Types of brakes -Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control. Derive the equation of Forces acting while applying a brakes on plain surface - inclined road-gradient .

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles-Engine modifications required-Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell. Turbo chargers -Engine emission control by three way catalytic converter system. Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL:45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Upon completion of this course, the students will be able to identify the different components in automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXTBOOKS:

1. Ganesan V. "Internal Combustion Engines", Third Edition, Tata McGraw-Hill, 2007.
2. Jain K. K. and Asthana R. B, "Automobile Engineering" Tata McGraw Hill Publishers, New Delhi, 2002.
3. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

REFERENCES:

1. Heinz Heisler, "Advanced Engine Technology," SAE International Publications USA, 1998.
2. Joseph Heitner, "Automotive Mechanics," Second Edition, East-West Press, 1999.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals," The Goodheart – Will Cox Company Inc, USA, 1978.
4. Newton, Steeds and Garet, "Motor Vehicles", Butterworth Publishers, 1989.

OBJECTIVES:

- To impart knowledge on the principle and design of control of Indoor/particulate/gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle- Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle- absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course, the students should be able to:

- Basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:

Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, Springer science + science media LLC, 2004.

2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland Press, Inc 2017.

3. Anjaneyulu. Y, “Air Pollution and Control Technologies”, Allied Publishers (P) Ltd., India 2002.

REFERENCES:

1. David H. F. Liu, Bela G. Liptak, “Air Pollution”, Lewis Publishers, 2000.

2. Arthur C. Stern, “Air Pollution (Vol. I – Vol. VIII)”, Academic Press, 2006.

3. Wayne T. Davis, “Air Pollution Engineering Manual”, John Wiley & Sons, Inc, 2000.

4. M. N. Rao and H. V. N. Rao, “Air Pollution”, Tata Mcgraw Hill Publishing Company limited, 2007.

5. C. S. Rao, “Environmental Pollution Control Engineering”, New Age International (P) Limited Publishers, 2006.

OBJECTIVES:

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- To introduce the fundamentals and components of Geographic Information System
- □ To provide details of spatial data structures and input, management and output processes.
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UNIT I FUNDAMENTALS OF GIS

9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attributed data- types of attributes – scales/levels of measurements.

UNIT II SPATIAL DATA MODELS

9

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures- Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III DATA INPUT AND TOPOLOGY

9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input – Digitiser – Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV DATA ANALYSIS

9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Elevation models - 3D data collection and utilisation.

UNIT V APPLICATIONS

9

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL: 45 PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output

TEXTBOOKS:

Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011. 2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

REFERENCES: Lo. C. P., Albert K. W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

LIST OF FREE ELECTIVE-II

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INTRODUCTION TO C PROGRAMMING

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OBJECTIVES

- To develop C programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions and structures

UNIT I INTRODUCTION

9

Structure of C program – Basics: Data Types – Constants – Variables – Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers
Text Book: Reema Thareja (Chapters 2,3)

UNIT II ARRAYS

9

Introduction to Arrays – One-dimensional arrays: Declaration – Initialization – Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two-dimensional arrays: Declaration – Initialization – Accessing elements – Operations: Read – Print – Sum – Transpose – Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort – Find whether the given matrix is diagonal or not.
Text Book: Reema Thareja (Chapters 5)

UNIT III STRINGS

9

Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Introduction to Pointers – Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names.
Text Book: Reema Thareja (Chapters 6 & 7)

UNIT IV FUNCTIONS

9

Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by 'n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function)
Text Book: Reema Thareja (Chapters 4)

UNIT V STRUCTURES

9

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions)
Text Book: Reema Thareja (Chapters 8)

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of this course, the students will be able to

- Develop simple applications using basic constructs
- Develop applications using arrays and strings
- Develop applications using functions and structures

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

TEXTBOOK

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016

REFERENCES:

1. Kernighan, B. W. and Ritchie, D. M., "The C Programming Language", Second Edition, Pearson Education, 2006
2. Paul Deitel and Harvey Deitel, "C How to Program", Seventh Edition, Pearson Publication
3. Juneja, B. L. and Anita Seth, "Programming in C", CENGAGE Learning India Pvt. Ltd., 2011

OBJECTIVES:

- To understand the various algorithm design and analysis techniques
- To learn linear data structures – lists, stacks, and queues
- To learn different sorting and searching algorithms
- To understand Tree and Graph data structures

UNIT I ALGORITHM ANALYSIS, LIST ADT**11**

Algorithms: Notation - analysis – running time calculations. Abstract Data Types (ADTs): List ADT – array-based implementation – linked list implementation – singly linked lists- applications of lists: Polynomial Manipulation. Implementation of List ADT using an array and using a linked list in C.

UNIT II STACKS AND QUEUES**7**

Stack ADT - Applications - Evaluating arithmetic expressions - Conversion of Infix to Postfix - Recursion. Queue ADT - Priority Queue - applications of queues. Implementation of Stack ADT and palindrome checking using C. Implementation of Queue operations using arrays in C.

UNIT III SEARCHING AND SORTING ALGORITHMS**10**

Divide and conquer methodology - Searching: Linear Search - Binary Search. Sorting: Insertion sort – Merge sort – Quick sort – Heap sort. Analysis of searching and sorting techniques. Implementation of linear search, binary search, insertion sort, merge sort and quick sort algorithms in C.

UNIT IV TREES**9**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree ADT – applications of trees. Heap – applications of heap. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C. Implementation of heap and heap sorting using arrays in C.

UNIT V GRAPHS**8**

Definition – Representation of Graph – Breadth-first traversal - Depth-first traversal – Dynamic programming Technique – Warshall's and Floyd's algorithm – Greedy method - Dijkstra's algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra's algorithm in C

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of this course, the students should be able to:

- Implement linear data structures and solve problems using them
- Implement and apply trees and graphs to solve problems.
- Implement the various searching and sorting algorithms.

TEXTBOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 1997.
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 1988.

REFERENCES:

1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
2. S. Sridhar, "Design and Analysis of Algorithms", First Edition, Oxford University Press, 2014
3. Byron Gottfried, Jitender Chhabra, "Programming with C" (Schaum's Outlines Series), McGraw Hill Higher Ed., III Edition, 2010
4. Yashvant Kanetkar, "Data Structures Through C", BPB publications, II edition, 2003

OBJECTIVES:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT**6**

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications- Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots- Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS**9**

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION**12**

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors, binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Servoing and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING**13**

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS**5**

RGV, AGV; Implementation of Robots in Industries- Various Steps; Safety Considerations for Robot Operations- Economic Analysis of Robots.

TOTAL: 45 PERIODS OUTCOME:

- Upon completion of this course, the students can be able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS: 1. Klatner R.D., Chmielewski T.A and Negin M., "Robotic Engineering- An Integrated Approach", Prentice Hall, 2003. 2. Groover M.P., "Industrial Robotics - Technology Programming and Applications", McGraw Hill, 2001.

OBJECTIVES:**The students should be made to:**

- Introduce the concept of diodes, Bipolar Junction Transistors and FET
- Study the various model parameters of Transistors
- Learn the concept of special semiconductor devices, Power & Display devices
- Impart the knowledge of various configurations, characteristics and applications.

UNIT I SEMICONDUCTOR DIODE**9**

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS**9**

NPN -PNP -Operations-Early effect-Current equations- Input and Output characteristics of CE, CB, CC - Hybrid - π model - h-parameter model, Ebers-Moll Model- Gummel Poon model, Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS**9**

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, DMOSFET, E-MOSFET- Characteristics-Comparison of MOSFET with JFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES**9**

Metal-Semiconductor Junction - MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Point Contact Diode, p-i-n Diode, Avalanche Photodiode, Schottky barrier diode Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES**9**

UJT, Thyristor -SCR, Diac, Triac, Power BJT-Power MOSFET-DMOS-VMOS. LED, LCD, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS**OUTCOMES:****After this course, the students should be able to:**

- Analyze the characteristics of semiconductor diodes.
- Analyze and solve problems of Transistor circuits using model parameters.
- Identify and characterize diodes and various types of transistors.
- Analyze the characteristics of special semiconductor devices.
- Analyze the characteristics of Power and Display devices.

TEXTBOOKS:

1. Millman and Halkias, "Electronic Devices and Circuits", 4th Edition, McGraw Hill, 2015.
2. Mohammad Rashid, "Electronic Devices and Circuits", Cengage Learning Pvt. Ltd, 2015.
3. Salivahanan. S, Suresh Kumar. N, "Electronic Devices and Circuits", 4th Edition, McGraw Hill, 2016.

REFERENCES:

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th Edition, McGraw Hill, 2012.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
3. Bhattacharya and Sharma, "Solid State Electronic Devices", 2nd Edition, Oxford University Press, 2014.
4. R. S. Sedha, "A Textbook of Electronic Devices and Circuits", 2nd Edition, S. Chand Publications, 2008.
5. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 9

Resistive elements-Ohm's Law Resistors in series and parallel circuits –Kirchoffs laws–Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation–star-delta conversion. Thevenin and Norton Theorems– Superposition Theorem– Maximum power transfer theorem– Reciprocity Theorem–Millman's theorem.

UNIT III AC CIRCUITS 9

Introduction to AC circuits, inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenin and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV THREE PHASE CIRCUITS 9

A.C.circuits–Average and RMS value-Phasor Diagram–Power, Power Factor and Energy.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced–phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance–their frequency response–Quality factor and Bandwidth-Self and mutual inductance– Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS**OUTCOMES:**

- Ability to introduce electric circuits and its analysis
- Ability to impart knowledge on solving circuit equations using network theorems
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams and analysis of three phase circuits

TEXTBOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N. O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. ME Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.

OBJECTIVES:**To Provide knowledge**

- About the stand alone and grid connected renewable energy systems.
- Design of power converters for renewable energy applications.
- Wind electrical generators and solar energy systems.
- Power converters used for renewable energy systems.

UNIT I INTRODUCTION

9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION

9

Reference theory fundamentals - principle of operation and analysis: IG and PMSG

UNIT III POWER CONVERTERS

9

Solar: Block diagram of solar photo voltaic system - Principle of operation: line commutated converters (inversion mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS

9

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system - Grid connection Issues - Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS

9

Need for Hybrid Systems - Range and type of Hybrid systems - Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL: 45 PERIODS**OUTCOMES:**

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.
- Ability to design power converters used for hybrid renewable energy systems.

TEXTBOOK:

1. S.N. Bhadra, D. Kasta, S. Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H. Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi, 2009.

REFERENCES:

1. Rashid. M.H "power electronics Handbook", Academic press, 2001.
2. Ion Boldea, "Variability speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Nonconventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall inc, 1995.
5. Andrzej M. Trzynadlowski, "Introduction to Modern Power Electronics", Second edition, Wiley India Pvt. Ltd, 2012.

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INDUSTRIALSAFETY

LTPC

3003

OBJECTIVES:

To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION

9

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS

9

Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation – Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL

9

Industrial Health Hazards – Environmental Control – Industrial Noise – Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS

9

System Safety Analysis – Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

UNIT V SAFETY REGULATIONS

9

Explosions – Disaster management – catastrophe control, hazard control, Safety education and training – Factories Act, Safety regulations Product safety – case studies

TOTAL: 45 PERIODS

OUTCOMES:

- Students must be able to identify and prevent chemical, environmental, mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management

TEXTBOOK:

1. John V. Grimaldi, "Safety Management", AITB Publishers, 2003.

REFERENCES:

1. Safety Manual, "EDEL Engineering Consultancy", 2000.
2. David L. Goetsch, "Occupational Safety and Health for Technologists", 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVE:

To understand the various destructive and non-destructive testing methods of materials and its industrial applications.

UNIT I INTRODUCTION TO MATERIAL TESTING 9

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II MECHANICAL TESTING 9

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NONDESTRUCTIVE TESTING 9

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING 9

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques - Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING 9

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS**OUTCOMES:**

- Identify suitable testing technique to inspect industrial component
- Ability to use the different technique and know its applications and limitations

TEXTBOOKS:

1. Baldev Raj, T. Jayakumar, M. Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
2. Cullity, B.D., "Elements of X-ray diffraction", 3rd Edition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, "The Mechanical Testing of Metals and Alloys" 7th Edition, Couses Press, 2007.

REFERENCES:

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9 Edition, American Society for Metals, 1978.
2. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings - Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings - Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45**PERIODS TEXTBOOKS:**

1. K.S. Jagadish, B. U. Venkataramareddy and K.S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

OBJECTIVES

- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic understandings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT

9

Water Quality-physical- chemical and biological parameters of water- water quality requirement - potable water standards -wastewater effluent standards-water quality indices. Water purification systems in natural systems- physical processes-chemical processes and biological processes- primary, secondary and tertiary treatment- Unit operations-unit processes. Mixing, clarification - sedimentation; Types; aeration and gas transfer – coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids- transport of colloidal particles, clariflocculation.

UNIT II INDUSTRIAL WATER TREATMENT

9

Filtration – size and shape characteristics of filtering media– sand filters hydraulics of filtration – design considerations – radial, upflow, high rate and multimedia filters, pressure filter. Water softening – lime soda, zeolite and demineralization processes – industrial water treatment for boilers.

UNIT III CONVENTIONAL TREATMENT METHODS

9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and defluoridation – desalination - corrosion prevention and control – factors influencing corrosion – Langelier index – corrosion control measures.

UNIT IV WASTEWATER TREATMENT

9

Wastewater treatment – pre and primary treatment – equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics– biological oxidation – lagoons and stabilization basins – aerated lagoons – activated sludge process – trickling filtration – anaerobic decomposition.

UNIT V ADSORPTION AND OXIDATION PROCESSES

9

Chemical process– adsorption– theory of adsorption– ion exchange process– chemical oxidation– advanced oxidation process – sludge handling and disposal – miscellaneous treatment processes.

TOTAL: 45 PERIODS**OUTCOMES**

- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:

1. Metcalf and Eddy, "Wastewater Engineering", 4th ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., "Industrial Water Pollution Control", 2nd Edn., McGraw Hill Inc., 1989.

REFERENCES

1. S.P. Mahajan, "Pollution control in process industries", 27th Ed. Tata McGraw Hill Publishing Company Ltd., 201
- 2.
2. M. Lancaster, "Green Chemistry: An Introductory Text", 2nd edition, RSC publishing, 2010.
3. C.S. Rao, "Environmental Pollution Control Engineering", New Age International, 2007.

***Research Integrated Curriculum**

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching-research relations, the following framework has been developed and widely adopted to help individual staff member, course teams and whole institutions analyze their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research–Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research-Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as, Level 1:

Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self-actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B.Tech.[CSE] curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
IV	Research Led Seminar	1
V	Research Methodology	3
VI	Participation in Bounded Research	2
VII	Design Project/Socio Technical Project (Scaffolded Research)	4
VIII	Project Work	10

Blueprint for assessment of student's performance in Research Led Seminar Course

● **Internal Assessment:** **40 Marks**

- Seminar Report (UG)/Concept Note (PG) : 5X4=20 Marks
- Seminar Review Presentation : 10 Marks
- Literature Survey : 10 Marks

● **Semester Examination :** **60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprintforassessmentofstudent'sperformanceinDesignProject

• ContinuousInternalAssessmentthroughReviews:	40Marks
• ReviewI : 10Marks	
• ReviewII: 10Marks	
• ReviewIII: 20 Marks	
• EvaluationofSocioTechnicalPracticumFinalReport:	40Marks
• Viva-VoceExamination:	20Marks
• Total:	100Marks

Blueprintforassessmentofstudent'sperformanceinResearchMethodology Courses

ContinuousInternalAssessment:	20Marks
• ResearchTools(Lab) :	10Marks
• Tutorial:	10Marks
ModelPaperWriting:	40Marks
• Abstract:	5Marks
• Introduction:	10Marks
• Discussion:	10Marks
• ReviewofLiterature:	5Marks
• Presentation:	10Marks
SemesterExamination:	40Marks
Total:	100Marks



PRISTUNIVERSITY
VALLAM, THANJAVUR.

DEPARTMENT OF
COMPUTERSCIENCE&ENGINEERING

PROGRAMHANDBOOK

B.TECH-CSE(PART-TIME)

[REGULATION2022]

[forcandidatesadmittedtoB.TechCSEprogramfromJune2022onwards]

PROGRAM EDUCATIONAL OBJECTIVES

The program objectives, address our mission of graduating students with solid foundation in computer science and engineering and to engage in activities that improve the welfare of society within a few years after their graduation. Based on the mission and vision, Program Educational Objectives are listed below:

- I. Graduating students to practice fundamentals of computer science engineering and apply their problem solving skills to analyze and solve engineering problems to meet the emerging needs of software industry.
- II. To encourage graduates to pursue advanced education, research and development, and other creative efforts in science and technology.
- III. Graduating students to achieve professional status due to their mastery of Computer Science theory and practice, exposure to emerging hardware technologies.
- IV. To endorse graduates with communication, and interpersonal skills to enable them to work in teams effectively in multidisciplinary field and in their professional careers.
- V. To impart the students to engage in lifelong learning and continuing professional development to use their understanding of the impact of technology on society for the benefit of humankind.

PROGRAM OUTCOMES

Program outcomes are the knowledge, skills, and behavior that students acquire during the time of graduation through the program objectives. Students should be in possession of:

- a) An ability to apply mathematical, algorithmic principles, and computing techniques in the modeling and design of computer-based systems.
- b) An ability to apply software engineering techniques to design, implement and test a software system, and to evaluate and compare the efficiencies of alternative solutions.
- c) Knowledge to identify and solve the open end problems to meet the requirements in computing industry.
- d) Understanding of network technologies to evolve and deploy network.
- e) An ability to choose best web technologies for solving web client/server problem and to create web pages with dynamic effects.
- f) An ability to work in multidisciplinary projects.
- g) Verbal skills to interact with customers, colleagues, and managers, and possess written communication skills to describe ideas, document processes, and results.
- h) An ability to engage in life-long learning to remain current in their profession and be leaders in technological society.
- i) The broad education necessary to understand the impact of computing in a global, economic, societal context and in all endeavors.
- j) Fundamental knowledge in digital circuits, communications systems and computer hardware.
- k) An ability to map computing ideas into working physical systems with the help of computing technologies for the benefit of society.

MAPPING OF PEO WITH PO

PEO	PROGRAM OUTCOMES										
	a	b	C	d	e	f	g	h	i	j	k
I	X	X		X	X						
II			X					X			
III							X				X
IV									X	X	
V						X					

COURSE STRUCTURE

SEMESTER I

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22148S11P	TransformsandPartialDifferentialEquations	3	1	0	4
22152S12P	DigitalSystems	3	1	0	4
22150H13P	DataStructuresandalgorithms	3	1	0	4
22150H14P	ComputerArchitectureandOrganization	3	1	0	4
22150H15P	ProblemSolvingAndPythonProgramming	3	0	0	3
TotalNo.ofcredits					19

SEMESTER II

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22148S21P	NumericalMethods	3	1	0	4
22150H22P	MicroprocessorsandInterfacing	3	1	0	4
22150H23P	DatabaseManagementSystems	3	1	0	4
22150H24P	DesignandAnalysisOfAlgorithm	3	1	0	4
22150H25P	ProgramminginC	3	0	0	3
TotalNo.ofcredits					19

SEMESTER III

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22148S31P	DiscreteMathematics	3	1	0	4
22150H32P	OperatingSystem	4	0	0	4
22150H33P	ArtificialIntelligence	4	0	0	4
22150H34P	ComputerNetworks	4	0	0	4
22150L35P	OperatingSystemsandNetworking Lab	0	0	3	2
TotalNo.ofcredits					18

SEMESTER IV

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150H41P	SoftwareEngineeringFundamentals	3	1	0	4
22150H42P	InternetProgramming	3	1	0	4
22150H43P	C#And.NetFramework	3	1	0	4
221E44_P	Elective-I	3	1	0	4
22150L45P	InternetProgrammingLab	0	0	3	2
TotalNo.ofcredits					18

SEMESTER-V

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150H51P	ObjectOrientedAnalysisand Design	4	0	0	4
22150H52P	SoftwareQualityManagement	1	1	1	1
22150H53P	GraphicsandMultimedia	3	1	0	4
221E54_P	Elective-II	3	1	0	4
22150L55P	SoftwareDevelopmentLab	0	0	3	2
TotalNo.ofcredits					18

SEMESTER-VI

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150H61P	CryptographyandNetworkSecurity	4	0	0	4
22150H62P	AdvancedJavaprogramming	3	1	0	4
22150H63P	SoftwareTesting	4	0	0	4
221E64_P	ElectiveIII	4	0	0	4
22150L65P	JavaProgrammingLab	0	0	3	2
TotalNo.ofcredits					18

SEMESTER-VII

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22160S71P	TotalQualityManagement	3	0	0	3
22150H72P	GridandCloudComputing	4	0	0	4
22150H73P	MiddlewareTechnologies	3	1	0	4
221E74_P	ElectiveIV	3	0	0	3
22150P75P	Project	0	0	12	6
TotalNo.ofcredits					20

LIST OF ELECTIVE SEMESTER- IV (ELECTIVE I)

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150E44AP	Theory of Computation	3	1	0	4
22150E44BP	Data Warehousing and Data Mining	3	1	0	4
22150E44CP	Professional Ethics in Engineering	3	1	0	4
22150E44DP	Advanced Databases	3	1	0	4

SEMESTER-V (ELECTIVE II)

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150E54AP	Adhoc and Sensor Networks	3	1	0	4
22150E54BP	Principles of Compiler Design	3	1	0	4
22150E54CP	Distributed Systems	3	1	0	4
22150E54DP	Mobile Computing	3	1	0	4

SEMESTER-VI (ELECTIVE III)

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22160E64AP	Principles of Management	4	0	0	4
22150E64BP	Unix Internals	4	0	0	4
22150E64CP	Graph Theory and Applications	4	0	0	4
22150E64DP	Programming paradigms	4	0	0	4

SEMESTER-VII(ELECTIVEVI)

SubjectCode	SubjectName	PeriodsPerWeek			C
		L	T	P	
22150E74AP	HighSpeedNetworks	3	0	0	3
22150E74BP	InformationRetrievalTechniques	3	0	0	3
22150E74CP	SoftwareProjectManagement	3	0	0	3
22150E74DP	CyberForensics	3	0	0	3

CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Project	Total Credit
	Nos	Credit	Nos	Credit	Nos	Credit	Credit	
I	5	19	-	-	-	-	-	19
II	5	19	-	-	-	-	-	19
III	4	16	-	-	1	02	-	18
IV	3	12	1	04	1	02	-	18
V	3	12	1	04	1	02	-	18
VI	3	12	1	04	1	02	-	18
VII	3	11	1	03	-	-	06	20
TotalCredits								130

TOTALCREDITS	
Semester-I	19
Semester-II	19
Semester-III	18
Semester-IV	18
Semester-V	18
Semester-VI	18
Semester-VI	20
TOTALCREDITS	130

22148S11P-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

AIM:

To develop the skills for the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory.

The course will also serve as a prerequisite for specialized studies and research.

OBJECTIVES:

- Solve simple second order differential equations;
- Be able to calculate Fourier series;
- Prove the Orthogonality of Eigen functions of boundary value problems;
- Be able to classify second order partial differential equations and choose the appropriate boundary conditions;
- Apply the method of separation of variables to standard PDEs;
- Understand the wide applications of differential equation;
- Use Laplace transform to solve simple linear differential equations.

UNIT I FOURIER SERIES 9+3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9+3hrs

Fourier integral theorem (without proof) – Sine and Cosine transforms – Properties (without Proof) – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier transform, Sine and Cosine transform.

UNIT III Z-TRANSFORM AND DIFFERENCE EQUATIONS 9+3hrs

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z – transform - Sampling of signals – an introduction.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9+3hrs

Formation of PDE – solution of standard type first order equation - Lagrange's line equation – Linear partial differential equations of second order and higher order with Constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS 9+3hrs

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

TOTAL: 60hrs

TEXTBOOKS:

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillan, New York, 1988.
2. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S.Chand & Company Ltd., New Delhi, 1996.

REFERENCES:

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramanaiah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
3. Advanced Modern Engineering Mathematics – Glyn James

CSE/Sem I

22152S12P-DIGITAL SYSTEMS

AIM:

To learn the fundamental concepts that are useful for designing digital systems or circuits.

OBJECTIVES:

- To introduce number systems and codes
- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memory devices.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9+3

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers. Binary Arithmetic- Binary codes -Boolean postulates and laws –De-Morgan's Theorem-Principle of Duality- Boolean expression – Boolean function- Minimization of Boolean expressions–Karnaugh map Minimization .

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR- Implementations of Logic Functions using gates, NAND –NOR implementations

UNIT II. COMBINATIONAL CIRCUITS 9+3

Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor-Carry look ahead adder- Multiplexer/ De multiplexer- Implementation using MUX- encoder / decoder – parity checker – code converters

UNIT III SEQUENTIAL CIRCUIT 9+3

Flip flops SR, JK, T, D and Master slave- Characteristic table and equation - Application table - Edge triggering - Level triggering - Realization of one flip flop using other flip flops - Asynchronous / Ripple counters - Synchronous counters - Modulo - n counter - Classification of sequential circuits - Introduction to shift registers

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9+3

Introduction to asynchronous sequential circuits - primitive state / flow table -
Minimization of primitive state table - state assignment - Excitation table - Excitation map - cycles - Races - Hazards: Static - Dynamic - Essential - Hazards elimination.

UNIT V MEMORY DEVICES 9+3

Classification of memories - RAM organization - Write/Read operation - Memory cycle - Timing wave forms - memory decoding - memory expansion - Static RAM Cell - Bipolar RAM cell - MOSFET RAM cell - Dynamic RAM cell - ROM organization - PROM - EPROM - EEPROM - EAPROM - Programmable Logic Devices - Implementation using ROM - Field Programmable Gate Arrays (FPGA)

TOTAL: 60hrs

TEXTBOOKS:

1. M. Morris Mano, Digital Design, 3 ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003 - (Unit I, II, V)
2. John M. Yarbrough, Digital Logic Applications and Design, Thomson - Vikas publishing house, New Delhi, 2002. (Unit III, IV)

REFERENCES:

1. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004
2. Charles H. Roth, "Fundamentals of Logic Design", Thomson Publication Company, 2003.
3. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 5^{ed.}, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
4. R. P. Jain, Modern Digital Electronics, 3^{ed.}, Tata McGraw - Hill publishing company limited, New Delhi, 2003
5. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003

22150H13P-DATA STRUCTURES AND ALGORITHMS**AIM:**

To emphasize, the practical application of techniques for analyzing the performance of algorithms and to know fundamentals of data structures.

OBJECTIVES:

- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To efficiently implement solutions for specific problems
- To gain knowledge of various sorting techniques.
- To efficiently implement the different data structures

UNIT-I PROBLEMSOLVING 9+3

Problemsolving-Top-Down Design-Implementation- Verification-Efficiency-Analysis - Sample Algorithms

UNIT II LISTS, STACKS AND QUEUES 9+3

Abstract Data Type (ADT) – The List ADT – The Stack ADT – Queue as ADT

UNIT III TREES 9+3

Binary trees: Operations on binary trees - Applications of binary trees - Binary tree representation - Node representation of binary trees - Implicit array representation of binary tree

UNIT-IV SORTING & SEARCHING 9+3

Preliminaries – Insertion Sort – Heapsort – Mergesort – Quicksort – Bubblesort
Basic Search Techniques – Linear Search – Indexed Sequential Search, Binary Search – Tree Searching – Inserting into a Binary searching tree – Deleting from a Binary Search tree

UNIT-V GRAPHS 9+3

Definitions – Shortest-Path Algorithms – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm - Depth first traversal - Application of depth first traversal - Breadth first traversal - Application of BFS.

TOTAL: 60hrs**TEXTBOOKS:**

1. R.G.Dromey, "How to solve it by computer", Prentice-Hall of India, 2002.
2. Aaron M. Tenenbaum, Yeediyah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004/PHI.
3. M.A.Weiss, "Data Structures and Algorithm Analysis in C", 2nd ed, Pearson Education Asia, 2002

REFERENCES:

1. E.Balagurusamy, 'Programming in Ansi C', Second Edition, Tata McGraw Hill Publication, 2003.

2. Robert L. Kruse, Bruce P. Leung, Clovis L. Tondo, "Data Structures and Program Design in C", Pearson Education, 2000 / PHI
3. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education Asia, 2004
4. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998
5. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson Education Asia, 1983

CSE/Sem I

22150H14P-COMPUTER ARCHITECTURE AND ORGANIZATION

AIM:

To understand the basic structure and organization of digital computer.

OBJECTIVES:

- To have a thorough understanding of operation of a digital computer.
- To list the operation of the arithmetic unit.
- To study in detail the different types of control and the concept of pipelining.
- To understand the hierarchy of memories.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTERS 10+3

Functional units - Basic operational concepts - Bus structures - Software performance - Memory locations and addresses - Memory operations - Instruction and instruction sequencing - Addressing modes - Assembly language

UNIT II ARITHMETIC UNIT 8+3

Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers - Signed operand multiplication and fast multiplication - Integer division

UNIT III BASIC PROCESSING UNIT 9+3

Fundamental concepts - Execution of a complete instruction - Multiple bus organization - Hardwired control - Microprogrammed control - Pipelining - Basic concepts - Data hazards - Instruction hazards - Superscalar operation.

UNIT IV MEMORY SYSTEM 9+3

Basic concepts - Semiconductor RAMs - ROMs - Speed - size and cost - Cache memories - Performance consideration - Virtual memory - Memory Management requirements - Secondary storage.

UNIT V I/O ORGANIZATION 9+3

Accessing I/O devices - Interrupts - Direct Memory Access - Buses - Interface circuits - Standard I/O Interfaces (PCI, SCSI, USB)

TOTAL: 60hrs

TEXTBOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The hardware software interface", 2nd Edition, Morgan Kaufmann, 2002.
3. John P. Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

22150H15P-PROBLEMSOLVING AND PYTHON PROGRAMMING

AIM:

To introduce the students about object oriented programming and design.

OBJECTIVES:

On completion of the class, a student should be able:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python

UNIT I ALGORITHMIC PROBLEMSOLVING 9

Algorithms building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flowchart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in an arranged list, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python Interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices,

immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum of array of numbers, linear search, binary search.

UNIT V LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters;
Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing-
list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT VI FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS

Text Book: Balagurusamy E, "Object Oriented Programming with C++", 3/E, TMG, 2006.

Reference:

1. Hubbard, "Programming with C++", 2/e, Schaum Outline Series, TMH, 2006.
2. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley Publications, Second Edition, 1991.
3. Sarang Proonachandra, "Object Oriented Programming with C++", PHI, 2006.
4. Jagadev AK, Rath AM, and Dehuri S, "Object Oriented Programming Using C++", PHI, 2007.

22148S21P-NUMERICALMETHODS

AIM:

Students will develop problem solving skills, with Numerical and Statistical Methods, which can be implemented in I.T. field.

OBJECTIVES:

- Demonstrate knowledge and understanding of numerical methods to solve ordinary differential equations
- Demonstrate knowledge and understanding of numerical methods to solve simple partial differential equations
- Introduce to students numerical methods and scientific computation techniques for dealing with important computational problems

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3hrs

Solution of equations – Newton Raphson's method, Regula-falsi methods Solution of linear System of equations by Gaussian elimination and Gauss-Jordan methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION 9+3hrs

Newton's forward and backward difference formulas – Central difference formula: Bessel's and Stirling's formula - Lagrangian Polynomials – Divided difference method.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9+3hrs

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge-Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3hrs

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL: 60hrs

TEXTBOOKS

1. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S. Chand Co. Ltd., New Delhi, 2003.

REFERENCES:

1. Burden, R. Land Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 1999.

CSE/SemII

22150H2P-MICROPROCESSORSANDINTERFACING

AIM:

To have an in-depth knowledge of the architecture and programming of 8-bit and 16-bit Microprocessors, Microcontrollers and to study how to interface various peripheral devices with them.

OBJECTIVES:

- To study the architecture and Instruction set of 8085 and 8086
- To develop assembly language programs in 8085 and 8086
- To design and understand multiprocessor configurations
- To study different peripheral devices and their interfacing to 8085/8086.
- To study the architecture and programming of 8051 microcontroller.

UNIT I 8085 CPU 9+3

8085 Architecture – Instruction set – Addressing modes – Timing diagrams – Interrupts – Memory interfacing – Interfacing, I/O devices

UNIT II PERIPHERALS INTERFACING 9+3

Interfacing Serial I/O (8251) – parallel I/O (8255) – Keyboard and Display controller 8279 Interrupt Controller – DMA controller - Bus: RS232C-RS485

UNIT III 8086 CPU 9+3

Intel 8086 Internal Architecture – 8086 Addressing modes - Instruction set - 8086 – Interrupts.

UNIT IV 8086 SYSTEM DESIGN 9+3

8086 signals and timing – MIN/MAX mode of operation – Addressing memory and I/O – System design using 8086

UNIT V 8085 APPLICATIONS 9+3

Stepper motor control – DC motor control – Traffic light control – LCD Controller – Square wave generation – Introduction to microcontroller. - 8051 Architecture.

TOTAL:60Hrs.

TEXTBOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000. (Unit I, II)
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3. S.P. Chowdhury, Sunetra Chowdhury, Microprocessor & Peripherals, First Edition, Scitech Publications (INDIA) Pvt. Ltd. (Unit V)

REFERENCES:

1. A.K. Ray and K.M. Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000 (Unit III, IV).
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola, Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

22150H23P-DATABASEMANAGEMENTSYSTEMS

AIM:

To know the methodologies in database technology and an introduction to the current trends in this field.

OBJECTIVES:

- To learn the fundamentals of data models.
- To understand the internal storage structures using different file and indexing techniques.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To understand the basic concepts of the emerging trends in the area of distributed DB- and OODB.

UNIT I INTRODUCTION AND CONCEPTUAL MODELING 9+ 3

Introduction to File and Database systems- Database system structure- Data Models- Introduction to Network and Hierarchical Models – ER model- Relational Model- Relational Algebra and Calculus.

UNIT II RELATIONAL MODEL 9+ 3

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT III DATA STORAGE AND QUERY PROCESSING 9+ 3

Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files – Different types of Indexes- B-Tree - Query Processing.

UNIT IV TRANSACTION MANAGEMENT 9+ 3

Transaction Processing – Introduction- Need for Concurrency control- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT V CURRENT TRENDS 9+ 3

Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogeneous- Distributed data Storage.

TOTAL: 60Hrs.

TEXTBOOKS:

1. AbrahamSilberschatz, HenryF. KorthandS. Sudarshan-
“DatabaseSystemConcepts”,Fourth Edition, McGraw-Hill, 2002.

REFERENCES:

1. RamezElmasriandShamkantB.Navathe,“FundamentalDatabaseSystems”,ThirdEdition,Pearson Education, 2003.
2. RaghuRamakrishnan,“DatabaseManagementSystem”,TataMcGraw-HillPublishing Company,2003.
3. HectorGarcia–Molina,JeffreyD.UllmanandJenniferWidom-
“DatabaseSystemImplementation”- Pearson Education- 2000.
4. Peter Rob and Corlos Coronel- “DatabaseSystem, Design, Implementation andManagement”, Thompson Learning Course Technology- Fifth edition, 2

CSE/SemII

22150H24P-DESIGNANDANALYSISOFALGORITHMS

AIM:

Thiscourseaimstointroducetheclassicandcomplexalgorithmsinvariousdomains,and techniques for designing and analyzing the efficient algorithms.

OBJECTIVES:

- Toprovethecorrectnessandanalyzetherunningtimeofthebasicalgorithms
- Toapplythealgorithmsanddesigntechniquesetosolveproblems.
- Toanalyzethecomplexitiesofvariousproblemsindifferentdomains.

UNITI BASICCONCEPTSOFALGORITHMS 8+ 3

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problemtypes – Fundamentals of the Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.

UNITII MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS 8+3

Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization.

UNITIII ANALYSIS OF SORTING AND SEARCHING ALGORITHMS 10+3

Brute Force – Bubble Sort – Sequential Search and Brute-force string matching – Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree- Decrease and Conquer – Insertion Sort – Depth first Search and Breadth First Search.

UNITIV ALGORITHMIC TECHNIQUES 10+ 3

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort – Dynamic Programming – Warshall’s and Floyd’s Algorithm – Optimal Binary Search trees – Greedy Techniques – Prim’s Algorithm – Kruskal’s Algorithm – Dijkstra’s Algorithm – Huffman trees.

UNITV ALGORITHM DESIGN METHODS 9+ 3

Backtracking – n-Queen’s Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.

TOTAL: 60 Hrs.

TEXTBOOKS:

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education Asia, 2003.

REFERENCES:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, “Introduction to Algorithms”, PHI Pvt. Ltd., 2001
2. Sara Baase and Allen Van Gelder, “Computer Algorithms – Introduction to Design and Analysis”, Pearson Education Asia, 2003.
3. A.V. Aho, J.E. Hopcroft and J.D. Ullman, “The Design and Analysis of Computer Algorithms”, Pearson Education Asia, 2003.

22150H22P-PROGRAMMING IN C

OBJECTIVES:

To develop C Programs using basic programming constructs

- To develop C Programs using arrays and strings
- To develop applications in C using functions, pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING 12

Introduction to programming paradigms – Structure of C program – C programming: Data Types – Storage classes – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Pre-processor directives – Compilation process

UNIT II ARRAYS AND STRINGS 9+3

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode – Two dimensional arrays – Example Program: Matrix Operations (Addition, ~~1,302~~ing, Determinant and

Transpose)-String operations: length, compare, concatenate, copy- Selection sort, linear and binary search

UNIT III FUNCTIONS AND POINTERS 9+3

Introduction of functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions)- Recursion- Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions- Pointers- Pointer operators- Pointer arithmetic- Arrays and pointers- Array of pointers- Example Program: Sorting of names- Parameter passing: Pass by value, Pass by reference Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

UNIT IV STRUCTURES 9+3

Structure- Nested structures- Pointer and Structures- Array of structures- Example Program using structures and pointers- Self-referential structures- Dynamic memory allocation- Singly linked list- type def

UNIT V FILE PROCESSING 9+3

Files- Types of file processing: Sequential access, Random access- Sequential access file- Example Program: Finding average of numbers stored in sequential access file- Random access file- Example Program: Transaction processing using random access files - Command line arguments

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to:

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.
- Design applications using sequential and random access file processing.

TEXTBOOKS:

1. Reema Thareja, — Programming in C, Oxford University Press, Second Edition, 2016.
2. Kernighan, B. W. and Ritchie, D. M., — The C Programming language, Second Edition, Pearson Education, 2006

REFERENCES:

1. Paul Deitel and Harvey Deitel, —C How to Program I, Seventh edition, Pearson Publication
2. Juneja, B. L. and Anita Seth, —Programming in C++, CENGAGE Learning India Pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C++, First Edition, Oxford University Press, 2009
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C++, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

CSE/Sem III

22148S31P-DISCRETE MATHEMATICS

AIM:

This course will develop the intuition for discrete mathematics reasoning involving numbers and sets.

OBJECTIVES:

On completing the course, students should be able to

- Write a clear statement of a problem as a theorem in mathematical notation;
- Prove and disprove assertions using a variety of techniques.
- Understand the logic of Propositional and predicate formulas and their relationship to informal reasoning, truth tables, validity.
- Understand the Proving of propositional and predicate formulas in a structured way.
- Know the basic set theory. Relations, graphs, and orders

UNIT I PROPOSITIONAL CALCULUS 10+ 3hrs

Propositions – Logical connectives – Compound propositions – Conditional and bi-conditional propositions – Truth tables – Tautologies and contradictions – Contrapositive – Logical equivalences and implications – DeMorgan's Laws - Normal forms – Principal conjunctive and disjunctive normal forms – Rules of inference – Arguments - Validity of arguments.

UNITII PREDICATECALCULUS 9+3hrs

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

UNITIII SETTHEORY 10+3hrs

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and their properties – sublattices – Boolean algebra – Homomorphism.

UNITIV FUNCTIONS 7+3hrs

Definitions of functions – Classification of functions – Type of functions – Examples – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.

UNITV GROUPS 9+3hrs

Algebraic systems – Definitions – Examples – Properties – Semigroups – Monoids – Homomorphism – Sub semigroups and Submonoids – Cosets and Lagrange's theorem – Codes and group codes – Basic notions of error correction – Error recovery in group codes.

TOTAL:60hrs**TEXTBOOKS:**

1. Trembly J. Pand Manohar R, "Discrete Mathematical Structures with Application to Computer Science", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 2003.
2. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia, Delhi, 2002.

REFERENCES:

1. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", Fourth Indian reprint, Pearson Education Pvt Ltd., New Delhi, 2003.
- Kenneth H. Rosen, "Discrete Mathematics and its Applications", Fifth Edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2003.

22150H32P-OPERATINGSYSTEM

AIM:

To understand the functions of an operating system.

OBJECTIVES:

- To have an overview of different types of operating systems.
- To know the components of an operating system.
- To have a knowledge of process management and storage management.
- To know the concepts of I/O and file systems.
- To know the concepts of Distributed Operating System

UNIT I 9

Introduction-Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

UNIT II 9

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

UNIT III 9

System Model – Deadlock Characterization – Methods for handling Deadlocks - Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging.

UNIT IV 9

Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing-Protection

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel/I/O Subsystems- Disk Structure– Disk Scheduling– Disk Management – Swap-Space Management. Case Study: The Linux System, Windows

TOTAL:45hrs

TEXTBOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, Sixth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2003.

REFERENCES:

1. Harvey M. Deitel, “Operating Systems”, Second Edition, Pearson Education Pvt. Ltd, 2002.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall of India Pvt. Ltd, 2003.
3. William Stallings, “Operating System”, Prentice Hall of India, 4th Edition, 2003.
4. Pramod Chandra P. Bhatt – “An Introduction to Operating Systems, Concepts and Practice”, PHI, 2003.

CSE/Sem III

22150H33P-ARTIFICIALINTELLIGENCE

AIM:

To create general understanding of major concepts and approaches in knowledge representation, planning, learning, robotics and other AI areas.

OBJECTIVES:

- To study various complex problems solving AI tools like Search and optimization
- To facilitate of logic, Probabilistic methods for uncertain reasoning, Classifiers and statistical learning methods, Neural networks, Control theory & Languages.
- To develop programming skills for AI applications.
- To provide exposure to logic programming with practical topics.

UNIT I INTRODUCTION 8+ 3

Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents - Problem Solving - problem solving agents – example problems – searching for solutions – uniformed search strategies - avoiding repeated states – searching with partial information.

UNIT II SEARCHING TECHNIQUES 10+ 3

Informed search and exploration – Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments - Structure of problems - Adversarial Search.

UNIT III KNOWLEDGE REPRESENTATION 10+ 3

First order logic – representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution - Knowledge representation - Ontological Engineering - Categories and objects – Actions - Simulation and events - Mental events and mental objects.

UNIT IV LEARNING 9+ 3

Learning from observations - forms of learning - Inductive learning - Learning decision Trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data - Learning with hidden variable .

UNIT V APPLICATIONS 8+ 3

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction .

TOTAL: 60

TEXTBOOK:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

REFERENCES:

1. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.

22150H34P-COMPUTER NETWORKS

AIM:

To introduce the concepts, terminologies and technologies used in modern days data communication and computer networking.

OBJECTIVES:

- To understand the concepts of data communications.
- To study the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make the students to get familiarized with different protocols and network components.

UNIT I DATA COMMUNICATIONS 9

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies – Protocols and Standards – ISO/OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences.

UNIT II DATA LINK LAYER 9

Error – detection and correction – Parity – LRC – CRC – Hamming code – flow Control and Error control - stop and wait – go back-N ARQ – selective repeat ARQ- sliding window – HDLC.-LAN-Ethernet IEEE802.3-IEEE802.4-IEEE802.5-IEEE802.11 – FDDI-SONET – Bridges.

UNIT III NETWORK LAYER 9

Internet works – Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT IV TRANSPORT LAYER 9

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Integrated Services.

UNIT V APPLICATION LAYER 9

Domain Name Space (DNS) – SMTP – FTP – HTTP – WWW – Security – Cryptography.

TOTAL: 45hrs

TEXTBOOK:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

REFERENCES:

James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 2003.

Larry L. Peterson and Peter S. Davie, "Computer Networks", Harcourt Asia Pvt. Ltd., Second Edition. Andrew S. Tanenbaum, "Computer Networks", PHI, Fourth Edition, 2003.

William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000.

CSE/Sem III

22150L35P-OPERATING SYSTEMS AND NETWORKING LAB

LIST OF EXERCISE:

OPERATING SYSTEMS:

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
 - command syntax
 - write simple functions
 - basic tests
2. Shell programming
 - loops
 - patterns
 - expansions
 - substitutions
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Implement some memory management schemes

NETWORKING:

1. Simulation of ARP/RARP.
2. Write a program that takes a binary file as input and performs bit stuffing and CRC computation.
3. Simulation of Sliding-Window protocol.
4. Develop a Client-Server application for chat.
5. Develop a Client that contacts a given DNS Server to resolve a given hostname.
6. Write a Client to download a file from a HTTP Server.

22150H41P-SOFTWAREENGINEERINGFUNDAMENTALS**AIM:-**

To makethestudentsunderstandthemethodologiesinpreparingasoftware.

OBJECTIVES:

- Toknowthegenericmodelstostructurethesoftwaredevelopmentprocess.
- Tounderstanddifferentnotionofcomplexityatboththemoduleandsystemlevel.
- Tobeawareofsomewidelyknown design methods.
- Tounderstandtheroleandcontentsof testingactivitiesindifferentlifecyclephases.

UNITI SOFTWAREPROCESS 9

Introduction–S/WEngineeringParadigm– lifecyclemodels (water fall,incremental,spiral, WINWINspiral, evolutionary, prototyping, object oriented) - system engineering – computer based system –verification – validation – life cycle process – development process –system engineering hierarchy.

UNITII SOFTWARE REQUIREMENTS 9

Functionalandnon-functional- user –system–requirement engineeringprocess –feasibilitystudies – requirements – elicitation – validation and management – software prototyping – prototyping in thesoftwareprocess –rapidprototypingtechniques –user interfaceprototyping-S/Wdocument. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

UNITIII DESIGNCONCEPTSANDPRINCIPLES 9

Design process and concepts – modular design – design heuristic – design model and document.Architectural design – software architecture – data design – architectural design – transform andtransaction mapping– user interfacedesign–user interfacedesignprinciples. Realtiesystems- Realtime software design – system design – real time executives – data acquisition system - monitoringand control system. SCM – Need for SCM – Version control – Introduction to SCM process –Software configuration items.

UNITIV TESTING 9

Taxonomy of softwaretesting – levels – test activities – types of s/wtest – black box testing – testingboundary conditions – structural testing – test coverage criteria based on data flow mechanisms –regression testing – testing in the large. S/W testing strategies – strategic approach and issues - unittesting – integration testing – validation testing – systemtesting and debugging.

UNITV SOFTWAREPROJECTMANAGEMENT 9

Measures and measurements – S/W complexity and science measure – size measure – data and logicstructure measure – information flow measure. Software cost estimation – function point models –COCOMO model- Delphimethod.- Defining a Task Network – Scheduling – Earned Value Analysis–Error Tracking - Software changes – program evolution dynamics – software maintenance – Architectural evolution. Taxonomy of CASE tools.

TOTAL:45hrs

TEXTBOOK:

1. Roger S. Pressman, Software Engineering - A Practitioner's Approach, McGraw-Hill International Edition, 5th edition, 2001.

REFERENCES:

1. Ian Sommerville, Software Engineering, Pearson Education Asia, 6th edition, 2000.
2. Pankaj Jalote - An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F. Peters and Witold Pedrycz, "Software Engineering - An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
4. Ali Behrooz and Frederick J. Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.

CSE/SemIV

22150H42P-INTERNET PROGRAMMING

OBJECTIVES:

- To understand different Internet Technologies.
- To learn java-specific web services architecture to design a context-free grammar for any given language.

UNIT I WEBSITE BASICS, HTML5, CSS3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet

protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to JavaScript – JavaScript DOM Model – Date and Objects – Regular Expressions – Exception Handling – Validation – Built-in objects – Event Handling – DHTML with JavaScript – JSON introduction – Syntax – Function Files – Http Request – SQL

UNIT III SERVER SIDE PROGRAMMING 9

Servlets: Java Servlet Architecture – Servlet Life Cycle – Form GET and POST actions – Session Handling – Understanding Cookies – Installing and Configuring Apache Tomcat Web Server – DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages – JSP Standard Tag Library (JSTL) – Creating HTML forms by embedding JSP code.

UNIT IV PHP and XML 9

An introduction to PHP: PHP – Using PHP – Variables – Program control – Built-in functions – Form Validation – Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML – Document Type Definition – XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEBSERVICES

9

AJAX: Ajax Client Server Architecture-XMLHttpRequest Object- Callback Methods: Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Construct a basic website using HTML and Cascading Style Sheets.
- Build a dynamic webpage with validation using JavaScript objects and by applying different event handling mechanisms.
- Develop server-side programs using Servlets and JSP.
- Construct simple web pages in PHP and to represent data in XML format.
- Use AJAX and web services to develop interactive web applications.
- Derive whether a problem is decidable or not.

TEXTBOOKS:

1. J. Deitel and Deitel and Nieto, — Internet and World Wide Web- How to Program I, Prentice Hall, 5th Edition, 2011.

REFERENCES:

1. Stephen Wynkoop and John Burke — Running a Perfect Website I, QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, — Web Technologies A Computer Science Perspective I, Pearson Education, 2011.
4. Gopalan N. P. and Akilandeswari J., Web Technology I, Prentice Hall of India, 2011.
5. Uttam K. Roy, — Web Technologies I, Oxford University Press, 2011.

22150H43P-C#AND.NETFRAMEWORK**AIM:**

The goal of this course is to provide students with the knowledge and skills they need to develop C# applications for the Microsoft .NET Platform.

OBJECTIVES:

- An ability to understand C# program structure, language syntax, and implementation details.
- An ability to develop application using C# on .NET framework.

UNIT I INTRODUCTION TO C# 8+3

Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations.

UNIT II OBJECT ORIENTED ASPECTS OF C# 9+3

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

UNIT III APPLICATION DEVELOPMENT ON .NET 8+3

Building Windows Applications, Accessing Data with ADO.NET.

UNIT IV WEB BASED APPLICATION DEVELOPMENT ON .NET 8+3

Programming Web Applications with Web Forms, Programming Web Services.

UNIT V THE CLR AND THE .NET FRAMEWORK**12+3**

Assemblies, Versioning, Attributes, Reflection, Viewing Meta Data, Type Discovery, Reflecting on a Type, Marshaling, Remoting, Understanding Server Object Types, Specifying a Server with an Interface, Building a Server, Building the Client, Using Single Call, Threads.

TOTAL:60hrs**TEXTBOOKS:**

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

REFERENCES:

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al., "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. S. Thamarai Selvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.

22150L45P-INTERNETPROGRAMMINGLAB

1. Write programs in Java to demonstrate the use of following components: Text fields, buttons, Scrollbar, Choice, List and Check box
2. Write Java program to demonstrate the use of various Layouts like FlowLayout, BorderLayout, GridLayout, GridBagLayout and CardLayout
3. Write programs in Java to create applets incorporating the following features:
4. Create a color palette with matrix of buttons
 - i) Set background and foreground of the control text area by selecting a color from color palette.
 - ii) In order to select foreground or background use check box control as radio buttons
 - iii) To set background images
5. Write programs in Java to do the following:
 - i) Set the URL of another server
 - ii) Download the homepage of the server
 - iii) Display the contents of home page with date, content type, and Expiration date, Last modified and length of the homepage
6. Write programs in Java using sockets to implement the following:
 - i) HTTP request
 - ii) FTP
 - iii) SMTP
 - iv) POP3
7. Write a program in Java for creating simple chat application with datagram sockets and datagram packets.
8. Create a webpage with the following using HTML
 - i) To embed a map in a webpage
 - ii) To fix the hotspots in that map
 - iii) Show all the related information when the hotspots are clicked.
9. Create a webpage with the following:
 - i) Cascading style sheets
 - ii) Embedded style sheets
 - iii) In-line style sheets
 - iv) Use our college information for the webpages

22150H51P-OBJECTORIENTEDANALYSISANDDESIGN**AIM:**

Study and learn the analysis techniques and methodologies.

OBJECTIVES:

- To study the concepts of modeling in object oriented context.
- To learn about the Object Constraint Language.
- To study the Use cases, Interaction Diagrams, Class Diagrams and System Sequence Diagrams.
- To study implementation related issues.
- To study and learn how to apply advanced techniques including Architectural Analysis and Design Patterns.

UNIT I INTRODUCTION 8

An Overview of Object Oriented Systems Development - Object Basics - Object Oriented Systems Development Life Cycle.

UNIT II OBJECTORIENTEDMETHODOLOGIES 12

Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns - Frameworks - Unified Approach - Unified Modeling Language - Use case - class diagram - Interactive Diagram - Package Diagram - Collaboration Diagram - State Diagram - Activity Diagram.

UNIT III OBJECTORIENTEDANALYSIS 9

Identifying use cases - Object Analysis - Classification - Identifying Object relationships - Attributes and Methods.

UNIT IV OBJECTORIENTEDEDESIGN 8

Design axioms - Designing Classes - Access Layer - Object Storage - Object Interoperability.

UNIT V SOFTWAREQUALITYANDUSABILITY 8

Designing Interface Objects - Software Quality Assurance - System Usability - Measuring User Satisfaction

TOTAL:45hrs

TEXTBOOKS:

1. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 1999 (Unit I, III, IV, V).
2. Martin Fowler, "UML Distilled", Second Edition, PHI/Pearson Education, 2002. (UNIT II)

REFERENCES:

1. Stephen R. Schach, "Introduction to Object Oriented Analysis and Design", Tata McGraw-Hill, 2003.
2. James Rumbaugh, Ivar Jacobson, Grady Booch "The Unified Modeling Language Reference Manual", Addison Wesley, 1999.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, "UML Toolkit", OMG Press Wiley Publishing Inc., 2004.

22150H52P-SOFTWARE QUALITY MANAGEMENT

AIM:-

To introduce an integrated approach to software development incorporating quality management methodologies.

OBJECTIVES:

- Software quality models.
- Quality measurement and metrics.
- Quality plan, implementation and documentation.
- Quality tools including CASE tools.
- Quality control and reliability of quality process.
- Quality management system models.
- Complexity metrics and Customer Satisfaction.
- International quality standards – ISO, CMM.

UNIT I INTRODUCTION TO SOFTWARE QUALITY 9+3

Software Quality – Hierarchical model of Boehm and McCall – Quality measurement – Metrics measurement and analysis – Gilb's approach – GQM Model

UNIT II SOFTWARE QUALITY ASSURANCE 9+3

Quality tasks – SQA plan – Teams – Characteristics – Implementation – Documentation – Reviews and Audits

UNIT III QUALITY CONTROL AND RELIABILITY 9+3

Tools for Quality – Ishikawa's basic tools – CASE tools – Defect prevention and removal – Reliability models – Rayleigh model – Reliability growth models for quality assessment

UNIT IV QUALITY MANAGEMENT SYSTEM 9+3

Elements of QMS – Rayleigh model framework – Reliability Growth models for QMS – Complexity metrics and models – Customer satisfaction analysis

UNIT V QUALITY STANDARDS 9+3

Need for standards – ISO 9000 Series – ISO 9000-3 for software development – CMM and CMMI – Six Sigma concepts.

TOTAL: 60hrs

TEXTBOOKS:

1. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Learning, 2003. (UI : Ch 1-4; UV: Ch 7-8)
2. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education (Singapore) Pte Ltd., 2002. (UI : Ch 3-4; UIII : Ch 5-8 ; UIV: Ch 9-11)

REFERENCES:

1. Norman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics" Thomson, 2003
2. Mordechai Ben-Menachem and Garry S. Marliss, "Software Quality", Thomson Asia Pte Ltd, 2003.
3. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, "CMMI", Pearson Education (Singapore) Pte Ltd, 2003.
4. ISO 9000-3 "Notes for the application of the ISO 9001 Standard to software development".

CSE/Sem V

22150H53P-GRAPHICSANDMULTIMEDIA

AIM:

Provide an opportunity for students to represent, design and implement two dimensional and three dimensional objects and introducing different media used in multimedia systems.

OBJECTIVES:

- Explain two and three dimensional concepts and their applications.
- Identify all techniques related to modern graphics programming concepts.
- Identify the media used in multimedia systems and to assess their relative advantages and disadvantages relative to both user and system points of view.
- Explain the interaction problems introduced by multimedia (e.g., compression and synchronization).

UNIT I OUTPUT PRIMITIVES 9+3

Introduction-Line-Curve and Ellipse Drawing Algorithms-Attributes-Two-Dimensional Geometric Transformations – Two-Dimensional Clipping and Viewing

UNIT II THREE-DIMENSIONAL CONCEPTS 9+3

Three-Dimensional Object Representations-Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III MULTIMEDIA SYSTEMS DESIGN 9+3

An Introduction- Multimedia applications – Multimedia System Architecture-Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV MULTIMEDIA FILE HANDLING 9+3

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V HYPERMEDIA 9+3

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

TOTAL: 60hrs

TEXTBOOKS:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003. (UNIT I : Chapters 1 to 6; UNIT 2: Chapter 9 – 12, 15, 16)
2. Prabat Kandleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003. (U

NIT 3 to 5)

REFERENCES:

1. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998
2. Foley, Van Dam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003

22150L55P-SOFTWARE DEVELOPMENT LAB

IMPLEMENTATION OF PROJECT USING SOFTWARE ENGINEERING TECHNIQUES:

1. PROJECT PLANNING
2. SOFTWARE REQUIREMENT ANALYSIS
3. DATA MODELLING & IMPLEMENTATION
4. SOFTWARE TESTING
5. SOFTWARE DEBUGGING

LIST OF EXPERIMENTS

Develop the following software using software Engineering methodology:

1. Online Railway reservations system
2. Simulator software for parallel processing operation
3. Payroll processing application
4. Inventory system
5. Simulator software for compiler operation
6. Automating the Banking process
7. Software for game
8. Library management system
9. Text editor
10. Create a dictionary
11. Telephone directory
12. Create an E-Book of your choice.

CSE/Sem VI

22150S61P-CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks..

UNIT I INTRODUCTION

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security - Security attacks, services and mechanisms - OSI security architecture - Classical encryption techniques: substitution techniques, transposition techniques, steganography - Foundation of modern cryptography: perfect security - information theory - product cryptosystem - cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic - Euclid's algorithm - Congruence and matrices - Groups, Rings, Fields - Finite fields - **SYMMETRIC KEY CIPHERS:** DES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - **ASYMMETRIC KEY CIPHERS:** RSA cryptosystem – Key distribution – Key management – Diffie-Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic - Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA – Digital signature and authentication protocols – DSS - Entity Authentication: Biometrics, Passwords, Challenge Response protocols - Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security - **SYSTEM SECURITY:** Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the fundamentals of network security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operations of public key cryptography
- Apply the various Authentication schemes to simulate different applications.
- Understand various Security practices and System security standards

TEXTBOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES:

1. CKShyamala, NHariniandDr.
TRPadmanabhan: CryptographyandNetworkSecurity, Wiley India Pvt.Ltd
2. BehrouzA.Foruzan, CryptographyandNetworkSecurity, TataMcGrawHill2007.
3. CharlieKaufman, RadiaPerlman, andMikeSpeciner, NetworkSecurity: PRIVATE
CommunicationinaPUBLIC World, PrenticeHall, ISBN0-13-046019-2

22150H62P-ADVANCED JAV A PROGRAMMING**AIM:**

To explore, advanced Java language features and packages.

OBJECTIVES:

- Use Java to implement OOAD.
- to have in-depth knowledge about Object serialization, reflection, RMI, Swing, JAR files.
- an ability to write Servlets and Java Server Pages.
- Gain an in-depth understanding of database programming in Java using JDBC.
- Learn Java's security model and how to do security programming in Java.

UNIT I JAV A FUNDAMENTALS 9+3

Java I/O streaming – filter and pipe streams – Byte Code interpretation -reflection– Dynamic Reflexive Classes – Threading – Java Native Interfaces- Swing.

UNIT II NETWORK PROGRAMMING IN JAV A 9+3

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services

UNIT III APPLICATIONS IN DISTRIBUTED ENVIRONMENT 9+3

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation

UNIT IV MULTI-TIER APPLICATION DEVELOPMENT 9+3

Server side programming – servlets – Java Server Pages - Applet to Applet communication – applet to Servlet communication - JDBC – Using BLOB and CLOB objects – storing Multimedia data into databases – Multimedia streaming applications – Java Media Framework.

UNIT V ENTERPRISE APPLICATIONS 9+3

Server Side Component Architecture – Introduction to J2EE – Session Beans – Entity Beans – Persistent Entity Beans – Transactions.

TOTAL: 60hrs

TEXTBOOKS:

1. Elliotte Rusty Harold, “Java Network Programming”, O’Reilly publishers, 2000 (UNIT II)
2. Ed Roman, “Mastering Enterprise Java Beans”, John Wiley & Sons Inc., 1999. (UNIT III and UNIT V)

3. Hortsman&Cornell,“COREJAVA2ADVANCEDFEATURES,VOLII”,Pearson Education,2002.(UNITIandUNIT IV)

REFERENCES:

1. Webreference:<http://java.sun.com>.
2. PatrickNaughton,“COMPLETEREFERENCE:JAVA2”,TataMcGraw-Hill,2003.

CSE/SemVI

AIM:

22150H63P-SOFTWARETESTING

Itexplainshowtoreview,testandmanagetestrequirementsandhowtoincorporatetestingintothesoftware development life cycle.

OBJECTIVES:

- Todeterminesoftwaretestingobjectivesandcriteria.
- Todevelopandvalidateatestplan.
- Toselectandpreparetestcases.
- Toidentifytheneedfortesting.
- Topreparetestingpoliciesandstandards.
- Touseestingaidsandtools.
- Totestbeforebuyinga softwarepackageandTestafter maintenanceandenhancement changes.
- Tomeasurethesuccessoftestingefforts.

UNITIINTRODUCTION

9

Testing as an Engineering Activity – Role of Process in Software Quality – Testing as aProcess –Basic Definitions – Software Testing Principles – The Tester’s Role in aSoftware DevelopmentOrganization – Origins of Defects – Defect Classes –TheDefectRepositoryandTest Design – DefectExamples – Developer/Tester Support for Developing a Defect Repository.

UNITITESTCASEDESIGN

9

Introduction to Testing Design Strategies – The Smarter Tester – Test Case DesignStrategies – UsingBlack Box Approach to Test CaseDesign RandomTesting –Requirements based testing – positiveandnegative testing — Boundary ValueAnalysis – decision tables - Equivalence Class Partitioning state-based testing– causeeffect graphing – error guessing - compatibility testing – user documentationtesting –domain testing Using White–Box Approach to Test design – Test Adequacy Criteria –statictesting vs. structural testing – codefunctional testing - Coverageand Control FlowGraphs – CoveringCode Logic – Paths – Their Role in White–box Based Test Design –code complexity testing –Evaluating Test Adequacy Criteria.

UNITIIILEVELSOFTESTING

9

TheNeed for Levels of Testing – Unit Test – Unit Test Planning –Designingthe Unit Tests, TheTestHarness – Running the Unit tests and Recording results – Integration tests – Designing IntegrationTests – Integration Test Planning – scenario testing –defect bash elimination -System Testing – typesof systemtesting - Acceptancetesting –performancetesting - Regression Testing–internationalizationtesting – ad-hoc testing -Alpha – Beta Tests – testing OO systems – usability and accessibility testing

People and organizational issues in testing – organization structures for testing teams – testing services

- Test Planning – Test Plan Components – Test Plan Attachments – role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group

UNIT V CONTROLLING AND MONITORING

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans – Reporting Review Results. – evaluating software quality – defect prevention – testing maturity model

TOTAL: 45hrs**TEXTBOOKS:**

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Aditya P. Mathur, "Foundations of Software Testing", Pearson Education, 2008.

REFERENCES:

1. Boris Beizer, "Software Testing Techniques", Second Edition, Dreamtech, 2003
2. Elfriede Dustin, "Effective Software Testing", First Edition, Pearson Education, 2003.
3. Renu Rajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004.

CSE/Sem VI**22150L65P-JAVA PROGRAMMING LAB****LIST OF PRACTICALS****AIM:**

To learn and practice the basics of JAVA language

OBJECTIVES:

1. To learn & practice the Object Oriented concepts like inheritance, Overloading etc.
2. To learn & practice Interfaces and Packages
3. To learn & practice Java applet programming

JAVABASICS

1. Programs illustrating various data types in Java
2. Programs illustrating class, objects and methods
3. Programs for addition and multiplication of Matrices

4. Programs illustrating Overloading in Java
5. Programs illustrating the implementation of Various forms of Inheritance (Single, Hierarchical, Multilevel)
6. Programs illustrating Overriding methods in Java
7. Programs illustrating Exception Handling
8. Programs to manipulate strings

JAVA INTERFACES, PACKAGES and THREADS

9. Programs illustrating Interfaces in Java
10. Programs to create Packages in Java
11. Programs illustrating Threads in Java

JAVA APPLETS

12. Programs to write applet to draw the various shapes
13. Programs to manipulate labels, lists, text fields and panels

CSE/Sem VII

22150S71P-TOTAL QUALITY MANAGEMENT

AIM:

Learning various TQM techniques to tackle and analyze problems in improving quality with particular reference to their own working environment.

OBJECTIVE:

- Develop the ability to adopt new techniques and synthesize new knowledge.
- Analyze basic operational and research data using TQM techniques in a systematic way.
- Cooperate efficiently and effectively in a team to apply TQM techniques and tools for accomplishing pre-determined goals.
- Identify opportunities for improvement in the business, service, administrative and manufacturing environments of applying the methodology such as Six Sigma, Kaizen, and other appropriate tools to achieve breakthrough improvements in these processes.

UNIT I FUNDAMENTALS 9

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of total quality management – Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation.

UNIT II TQM PRINCIPLES 9

Customer Satisfaction – Customer Perception of Quality – Customer Complaints – Service Quality – Customer Retention – Employee Involvement – Motivation – Empowerment – Teams – Recognition and Reward – Performance Appraisal – Benefits – Continuous Process Improvement – Juran Trilogy
 – PDCA Cycle – 5S – Kaizen – Supplier Partnership – Partnering – Sourcing – Supplier Selection
 – Supplier Rating – Relationship Development – Performance Measures – Basic Concepts – Strategy
 – Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The Seven Tools of Quality – Statistical Fundamentals – Measures of Central Tendency and dispersion – Population and Sample – Normal Curve – Control Charts for Variables and Attributes – Process Capability – Concept of Six Sigma – New Seven Management Tools.

Benchmarking – Reasons to Benchmark – Benchmarking Process – Quality Function Deployment(QFD)
– House of Quality – QFD Process – Benefits – Taguchi Quality Loss Function – Total
Productive Maintenance (TPM) – Concept – Improvement Needs – FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS

9

Need for ISO 9000 and Other Quality Systems – ISO 9000:2000 Quality System – Elements –
Implementation of Quality System – Documentation – Quality Auditing – TS 16949 – ISO 14000 –
Concept – Requirements and Benefits.

Total: 45 hrs

TEXTBOOK:

1. Besterfield et al. D.H., “Total Quality Management”, Pearson Education, Inc. 2003.

REFERENCES:

1. Evans, J.R. and Lindsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002
2. Feigenbaum, A.V., “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland, J.S., “Total Quality Management”, 3rd Edition, Elsevier, 2005.
4. Narayana, V. and Sreenivasan, N.S., “Quality Management - Concepts and Tasks”, New Age International, 1996.
5. Zeiri, “Total Quality Management for Engineers”, Woodhead Publishers, 1991.

CSE/Sem VII

22150H72P-GRID AND CLOUD COMPUTING

OBJECTIVES:

The students should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

UNIT I INTRODUCTION 9

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers – Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

UNIT II GRID SERVICES 9

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

UNIT III VIRTUALIZATION 9

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNITIV PROGRAMMINGMODEL 9

Opensourcegridmiddlewarepackages–GlobusToolkit(GT4)Architecture,Configuration–
Usage ofGlobus – Maincomponents and Programming model- Introductionto Hadoop
Framework–
Mapreduce,Inputsplitting,mapandreducefunctions,specifyinginputandoutputparameters,
configuringandrunningajob– DesignofHadoopfilesystem,HDFSconcepts, command line
and java interface, dataflow ofFile read & File write.

UNITV SECURITY 9

TrustmodelsforGridsecurityenvironment–AuthenticationandAuthorizationmethods–
Gridsecurityinfrastructure–CloudInfrastructuresecurity:network,hostandapplicationlevel–
aspects ofdata security, provider data and its security, Identityand access management
architecture, IAM practices inthe cloud, SaaS, PaaS, IaaS availability inthe cloud, Key
privacy issues in the cloud.

TOTAL:45PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Apply techniques to solve large scale scientific problems.
- Apply the concept of virtualization.
- Use the grid and cloud toolkits.
- Apply these security models in the grid and the cloud environment.

TEXTBOOK:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES:

1. Jason Venner, "Pro Hadoop - Build Scalable, Distributed Applications in the Cloud", A Press, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann.
5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009.
6. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.
7. Barry Wilkinson, "Grid Computing: Techniques and Applications", Chapman and Hall, CRC, Taylor and Francis Group, 2010.

22150H73P-MIDDLEWARETECHNOLOGIES

AIM:

Students are able to gain in-depth knowledge popular middleware platforms.

OBJECTIVES:

Students can able to

- Understand that middleware is an intermediary software layer between the application and the operating system, which encapsulates the heterogeneity of the underlying communication network, operating system or hardware platform.
- Acquire the knowledge of integrating these systems by using middleware technologies.

UNIT I CLIENT/SERVER CONCEPTS 9+3

Client server – File server – Database server – Group server – Object server – Web server – Middleware – General middleware – Service specific middleware – Client/Server building blocks – RPC – Messaging – Peer-to-Peer.

UNIT II EJB ARCHITECTURE 9+3

EJB – EJB Architecture – Overview of EJB software architecture – View of EJB – Conversation – Building and deploying EJB – Roles in EJB.

UNIT III EJB APPLICATIONS 9+3

EJB session beans – EJB entity beans – EJB clients – EJB deployment – Building an application with EJB.

UNIT IV CORBA 9+3

CORBA – Distributed systems – Purpose – Exploring CORBA alternatives – Architecture overview – CORBA and networking model – CORBA object model – IDL – ORB – Building an application with CORBA.

UNITVCOM**9+3**

COM – Data types – Interfaces – Proxy and stub – Marshalling – Implementing server / client – Interface pointers – object creation – Invocation – Destruction – Comparison COM and CORBA – Introduction to .NET – Overview of .NET architecture – Marshalling – Remoting.

TOTAL:60hrs**TEXTBOOKS:**

1. Robert Orfali, Dan Harkey and Jeri Edwards, “The Essential Client / Server Survival Guide”, Galgotia Publications Pvt. Ltd., 2002. 2. Tom Valesky, “Enterprise Java Beans”, Pearson Education, 2002.

REFERENCES:

1. Mowbray, “Inside CORBA”, Pearson Education, 2002.
2. Jeremy Rosenberger, “Teach Yourself CORBA in 14 days”, TEC Media, 2000.
3. Jason Pritchard, “COM and CORBA Side by Side”, Addison Wesley, 2000.
4. Jesse Liberty, “Programming C#”, 2nd Edition, O’Reilly Press, 2002.

CSE/SemIV/Electives**SEMESTER-IV(ELECTIVEI)****22150E44AP-THEORY OF COMPUTATION****AIM:**

To introduce basic computation models and the necessary mathematical techniques to express computer science problems as mathematical statements and to formulate proofs

OBJECTIVES:

- To focus on the study of abstract models of computation.
- To assess via formal reasoning what could be achieved through computing when they are using it to solve problems in science and engineering.
- To introduce fundamental questions about problems, such as whether they can or not be computed, and if they can, how efficiently.

UNIT I**AUTOMATA****9+3**

Introduction to formal proof – Additional forms of proof – Inductive proofs – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

UNIT II**REGULAR EXPRESSIONS AND LANGUAGES****9+3**

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

UNIT III**CONTEXT-FREE GRAMMAR AND LANGUAGES****9+3**

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNITIV PROPERTIESOFCONTEXT-FREELANGUAGES 9+3

Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNITV UNDECIDABILITY 9+3

A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Undecidable problems about Turing Machine – Post's Correspondence Problem- The classes P and NP.

TOTAL:60hrs

TEXTBOOK:

1. J.E.Hopcroft,R.MotwaniandJ.DULLman,“IntroductiontoAutomataTheory, LanguagesandComputations”,SecondEdition,PearsonEducation,2003.

REFERENCES:

1. H.R.LewisandC.H.Papadimitriou,“ElementsofThetheoryofComputation”,SecondE dition, Pearson Education/PHI, 2003
2. J.Martin,“IntroductiontoLanguagesandtheTheoryofComputation”,ThirdEdition, TM H, 2003.
3. MichealSipser,“IntroductionoftheTheoryandComputation”,ThomsonBrokecole,1997

22150E44BP-DATA WAREHOUSING AND DATA MINING

OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE

9 ANALYTICAL PROCESSING (OLAP)

Basic Concepts-Data Warehousing Components–Building a Data Warehouse–Database Architectures for Parallel Processing–Parallel DBMS Vendors-Multidimensional Data Model–Data Warehouse Schemas for Decision Support, Concept Hierarchies - Characteristics of OLAP Systems–Typical OLAP Operations, OLAP and OLTP.

UNIT II DATA MINING–INTRODUCTION 9

Introduction to Data Mining Systems–Knowledge Discovery Process–Data Mining Techniques–Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing–Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III DATA MINING-FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations–Mining Methods–Pattern Evaluation Method–Pattern Mining in Multilevel, Multi Dimensional Space–Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification–Classification by Back Propagation–Support Vector Machines–Lazy Learners–Model Evaluation and Selection-Techniques to improve Classification Accuracy.

Clustering Techniques–Cluster analysis-Partitioning Methods-Hierarchical Methods–Density Based Methods-Grid Based Methods–Evaluation of clustering–Clustering high dimensional data-Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL 9

Datasets–Introduction, Iris plants database, Breast cancer database, Auto imports database-Introduction to WEKA, The Explorer–Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Design a Data warehouse system and perform business analysis with OLAP tools.
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis

TEXTBOOKS:

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCES:

1. Alex Berson and Stephen J. Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

22150E44CP-PROFESSIONALETHICSINENGINEERING

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 8

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflict of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES

Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

OUTCOMES:**At the end of the course, the students should be able to:**

- To apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, —Ethics in Engineering, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S., —Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, —Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases, Cengage Learning, 2009.
3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility, McGraw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. 6. World Community Service Centre, 'Value Education', Vethathiripublications, Erode, 2011.

CSE/Sem IV/Electives

22150E44DP-ADVANCED DATABASES**AIM:**

To have strong knowledge on Database Management Systems, Database technologies, an application-oriented, system-oriented approach towards database design.

OBJECTIVES:

- Be able to design high-quality relational databases and database applications.
- Have developed skills in advanced visual & conceptual modeling and database design.
- Be able to translate complex conceptual data models into logical and physical database designs.
- Have developed an appreciation of emerging database trends as they apply to semi-structured data, the internet, and object-oriented databases.

UNIT I DISTRIBUTED DATABASES 9+3

Distributed DBMS Concepts and Design – Introduction – Functions and Architecture of DDBMS – Distributed Relational Database Design – Transparency in DDBMS – Distributed Transaction Management – Concurrency control – Deadlock Management – Database recovery – The X/Open Distributed Transaction Processing Model – Replication servers – Distributed Query Optimisation - Distribution and Replication in Oracle.

UNIT II OBJECT ORIENTED DATABASES 9+3

Object Oriented Databases – Introduction – Weakness of RDBMS – Object Oriented Concepts Storing Objects in Relational Databases – Next Generation Database Systems – Object Oriented Data models – OODBMS Perspectives – Persistence – Issues in OODBMS – Object Oriented Database Management System Manifesto – Advantages and Disadvantages of OODBMS – Object Oriented Database Design – OODBMS Standards and Systems – Object Management Group – Object Database Standard ODMG – Object Relational DBMS – Postgres-Comparison of ORDBMS and OODBMS.

UNIT III WEB DATABASES 9+3

Web Technology And DBMS – Introduction – The Web – The Web as a Database Application Platform – Scripting languages – Common Gateway Interface – HTTP Cookies – Extending the Web Server – Java – Microsoft's Web Solution Platform – Oracle Internet Platform – Semi structured Data and XML – XML Related Technologies – XML Query Languages

UNIT IV INTELLIGENT DATABASES 9+3

Enhanced Data Models For Advanced Applications – Active Database Concepts And Triggers – Temporal Database Concepts – Deductive databases – Knowledge Databases.

UNIT V CURRENT TRENDS 9+3

Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Parallel Database – Spatial Databases - Database administration – Data Warehousing and Data Mining.

TOTAL: 60hrs

TEXTBOOK:

1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation, and Management", Third Edition, Pearson Education, 2003

REFERENCES:

1. Ramez Elmasri & Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2004.
2. M. Tamer Ozsu, Patrick Ualduriel, "Principles of Distributed Database Systems", Second Edition, Pearson Education, 2003.
3. C.S.R. Prabhu, "Object Oriented Database Systems", PHI, 2003.
4. Peter Roband Corlos Coronel, "Database Systems – Design, Implementation and Management", Thompson Learning, Course Technology, 5th Edition, 2003.

SEMESTER -V(ELECTIVEII)
22150E54AP-ADHOCANDSENSORNETWORKS

OBJECTIVES:

The students should be made to:

- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of ad hoc routing protocols.
- Be exposed to the TCP issues in ad hoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel – mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) : concepts and architectures.
Application of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in designing a MAC Protocol - Classification of MAC Protocols - Contention based protocols - Contention based protocols with Reservation Mechanisms - Contention based protocols with Scheduling Mechanisms – Multi channel MAC - IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS 9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks - proactive routing, reactive routing (on-demand), hybrid routing - Classification of Transport Layer solutions - TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNs) AND MAC PROTOCOLS 9

Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures - data relaying and aggregation strategies - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS 9

Issues in WSN routing – OLSR - Localization – Indoor and Sensor Network Localization - absolute and relative localization, triangulation - QOS in WSN - Energy Efficient Design - Synchronization - Transport Layer issues

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to:

- Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
- Analyze the protocol design issues of ad hoc and sensor networks
- Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
- Evaluate the QoS related performance measurements of ad hoc and sensor networks

TEXTBOOK:

1. C.SivaRamMurthy, and B.S.Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, 2008.

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication-2002.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks: Technology, Protocols, and Applications", John Wiley, 2007.

22150E54BP-PRINCIPLES OF COMPILER DESIGN

AIM:

To understand the design and implementation of a simple compiler.

OBJECTIVES:

- To understand the functions of the various phases of a compiler.
- To learn the overview of the design of lexical analyzer and parser.
- To study the design of the other phases in detail.
- To learn the use of compiler construction tools.

UNIT I INTRODUCTION TO COMPILING 9+3

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens.

UNIT II SYNTAX ANALYSIS 9+3

Role of the parser – Writing Grammars – Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

UNIT III INTERMEDIATE CODE GENERATION 9+3

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

UNIT IV CODE GENERATION**9+3**

Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

UNIT V CODE OPTIMIZATION AND RUNTIME ENVIRONMENTS 9+3

Introduction – Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

TOTAL: 60hrs**TEXTBOOK:**

1. Alfred Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2003.

REFERENCES:

1. Allen I. Holub "Compiler Design in C", Prentice Hall of India, 2003.
2. C.N. Fischer and R.J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003.
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

22150E54CP- DISTRIBUTED SYSTEMS**AIM:**

This course discusses the fundamental aspects on design of distributed systems, and the principles underlying them with an emphasis on fault tolerance and security.

OBJECTIVES:

- To understand distributed computing system models and introduction to distributed databases.
- To have an in-depth knowledge of distributed algorithms.
- To understand asynchronous shared memory model, mutual exclusion, resource allocation, consensus, asynchronous network model, basic asynchronous network algorithms, shared memory Vs networks and introduction to parallel distributed processing.
- To understand the various security algorithms in distributed environment.

UNIT I INTRODUCTION 9+3

Introduction to Distributed systems-examples of distributed systems, challenges-architectural models-fundamental models - Introduction to interprocess communications-external data representation and marshalling- client server communication-group communication – Case study: IPC in UNIX

UNIT II DISTRIBUTED OBJECTS AND FILE SYSTEM 9+3

Introduction-Communication between distributed objects-Remote procedure call-Events and notifications-Java RMI case Study-Introduction to DFS-File service architecture-Sun network filesystem-Introduction to Name Services-Name services and DNS-Directory and directory services

UNIT III DISTRIBUTED OPERATING SYSTEMS SUPPORT 11+3

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging – Distributed mutual exclusion.

UNIT IV TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS 8+3

Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery

UNIT – V SECURITY AND REPLICATION 8+3

Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Replication-System model and group communications – Fault tolerant services – Highly available services – Transactions with replicated data

TOTAL: 60hrs

TEXTBOOK:

1. George Coulouris, Jean Dollimore, Tim Kindberg “Distributed Systems Concepts and Design” Third Edition – 2002- Pearson Education Asia.

REFERENCES:

1. A.S. Tanenbaum, M. Van Steen “Distributed Systems” Pearson Education 2004
2. Mukesh Singhal, Ohio State University, Columbus “Advanced Concepts In Operating Systems” McGraw-Hill Series in Computer Science, 1994.

22150E54DP-MOBILE COMPUTING**AIM:**

The aim of the course is to make student to be familiar with the basics concept of Mobile Communication and mobile devices .Focus will be on cellular mobile system units and different aspects of cellular communication.

OBJECTIVES:

- To present necessary concepts for Mobile Communication.
- Understanding different mobile devices and system.
- Understanding the Cellular System design.
- Study Co-channel and Non Co-channel Interference.
- Understanding channel assignment and handoff.
- Study Digital Cellular System.

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9+3

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT II TELECOMMUNICATION NETWORKS 11+3

Telecommunications systems – GSM – GPRS – DECT – UMTS – IMT-2000 – Satellite Networks – Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB – DVB.

UNIT III WIRELESS LAN 9+3

Wireless LAN – IEEE 802.11 – Architecture – services – MAC – Physical layer – IEEE 802.11a – 802.11b standards – HIPERLAN – Blue Tooth.

UNIT IV MOBILE NETWORK LAYER 9+3

Mobile IP – Dynamic Host Configuration Protocol – Routing – DSDV – DSR – Alternative Metrics.

UNIT V TRANSPORT AND APPLICATION LAYERS 7+3

Traditional TCP – Classical TCP improvements – WAP, WAP 2.0.

Total: 60hrs**TEXTBOOKS:**

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003. (Unit I Chap 1, 2 & 3 – Unit II chap 4, 5 & 6 – Unit III Chap 7. Unit IV Chap 8 – Unit V Chap 9 & 10.)
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002. (Unit I Chapter – 7 & 10 – Unit II Chap 9)

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.

2. UweHansmann,LotharMerk,MartinS.NicklonsandThomasStober,“PrinciplesofMobileC
omputing”, Springer, New York, 2003.

3. HazysztofWesolowshi,“MobileCommunicationSystems”,JohnWileyandSonsLtd,2002.

CSE/SemVI/Electives

SEMESTER-
VI(ELECTIVEI
II)

22160E64AP-PRINCIPLESOFMANAGEMENT

AIM:

To understand the basic principles of management.

OBJECTIVES:

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

UNIT I HISTORICAL DEVELOPMENT 9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – contribution of Taylor and Fayol – Functions of Management – Types of Business Organization.

UNIT II PLANNING 9

Nature & Purpose – Steps involved in planning – Objective – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning premise – Forecasting – Decision-making.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – Selection Process – Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of overall Performance

TOTAL:45hrs

TEXTBOOKS:

1. HaroldKooritz&HeinzWehrich“EssentialsofManagement”,TataMcGraw-Hill, 1998.
2. JosephLMassie“EssentialsofManagement”,PrenticeHallofIndia,(pearson)Fourth Edition,2003.

REFERENCES

1. TripathyPCAndReddyPN,“PrinciplesofManagement”,TataMcGraw-Hill,1999.
2. DecenzoDavid,RobbinStephenA,“PersonnelandHumanReasnsManagement”,P rentice Hall of India, 1996.
3. JAFStomer,FreemanR.EandDanielRGillbertManagement,pearsonEducation,S ixth Edition,2004.
4. FraidoonMazda,“EngineeringManagement”,AddisonWesley,2000.

22150E64BP-UNIXINTERNALS**AIM:**

This course focuses on bending the learning curve for those system programmers who need to cast free software kernels.

OBJECTIVES:

- An ability to understand design and implementation of a multi-programmable operating system.
- A good understanding of the fundamentals of a monolithic kernel.
- A basic-to-intermediate experience in kernel and driver/module programming.

UNIT I 9

General Review of the System-History-System structure-User Perspective-Operating System Services-Assumptions About Hardware. Introduction to the Kernel-Architecture-System Concepts-Data Structures- System Administration.

UNIT II 9

The Buffer Cache-Headers-Buffer Pool-Buffer Retrieval-Reading and Writing Disk Blocks-Advantages and Disadvantages. Internal Representation of Files-Inodes-Structure-Directories-PathName to Inode- Super Block-Inode Assignment-Allocation of Disk Blocks -Other File Types.

UNIT III 9

System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special files Creation-Change Directory and Change Root-Change Owner and Change Mode- Stat-Fstat-Pipes-Dup-Mount-Unmount-Link-Unlink-File System Abstraction-Maintenance.

UNIT IV 9

The System Representation of Processes-States-Transitions-System Memory-Context of a Process-Saving the Context-Manipulation of a Process Address Space-Sleep-Process Control-signals-Process Termination-Awaiting-Invoking other Programs-The Shell-System Boot and the INIT Process.

UNIT V 9

Memory Management Policies-Swapping-Demand Paging-a Hybrid System-I/O Subsystem-Driver Interfaces-Disk Drivers-Terminal Drivers.

TOTAL:45hrs**TEXTBOOK:**

1. Maurice J. Bach, "The Design of the Unix Operating System", Pearson Education, 2002.

REFERENCES:

1. Uresh Vahalia, "UNIX Internals: The New Frontiers", Prentice Hall, 2000.
2. John Lion, "Lion's Commentary on UNIX", 6th edition, Peer-to-Peer Communications, 2004.
3. Daniel P. Bovet & Marco Cesati, "Understanding the Linux Kernel", O'REILLY, Shroff Publishers & Distributors Pvt. Ltd, 2000.
4. M. Becketal, "Linux Kernel Programming", Pearson Education Asia, 2002

22150E64CP-GRAPH THEORY AND APPLICATIONS

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I **9**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II **9**

Trees - Properties - Distance and Centres - Types - Rooted Tree - Tree Enumeration - Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits - Cut Sets - Properties - Fundamental Circuit and Cut-set - Connectivity - Separability - Related Theorems.

UNIT III **9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV **9**

Matrix Representation - Adjacency matrix - Incidence matrix - Circuit matrix - Cut-set matrix - Path Matrix - Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V **9**

Graph Algorithms - Connectedness and Components - Spanning Tree - Fundamental Circuits - Cut Vertices - Directed Circuits - Shortest Path - Applications overview.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

22150E64CP-GRAPHTHEORYANDAPPLICATIONS**OBJECTIVES:**

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I 9

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph -Related Theorems.

UNIT II 9

Trees -Properties- Distance and Centres - Types -Rooted Tree--Tree Enumeration- Labeled Tree - Unlabeled Tree -Spanning Tree - Fundamental Circuits-Cut Sets -Properties- Fundamental Circuit and Cut-set-Connectivity-Separability-Related Theorems.

UNIT III 9

Network Flows-Planar Graph-Representation-Detection-Dual Graph- Geometric and Combinatorial Dual- Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV 9

Matrix Representation-Adjacency matrix-Incidence matrix-Circuit matrix-Cut-set matrix - Path Matrix-Properties-Related Theorems-Correlations.Graph Coloring- Chromatic Polynomial- Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V 9

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL:45PERIODS**OUTCOMES:****At the end of the course, the students should be able to:**

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

TEXTBOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds, "Graph Theory Applications", Springer, 2016.

REFERENCES:

1. Bondy, J.A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication, 2008.
2. West, D.B., — Introduction to Graph Theory, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, — A First Look at Graph Theory, World Scientific Publishing Company, 1991.
4. Diestel, R., "Graph Theory", Springer, 3rd Edition, 2006.
5. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2007.

CSE/Sem VI/Electives

22150E64DP-PROGRAMMING PARADIGMS

AIM:

Develop a greater understanding of the issues involved in programming language design and implementation

OBJECTIVES:

- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.
- Implement several programs in languages other than the one emphasized in the core curriculum (Java/C++).
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.
- Develop an understanding of the compilation process.

UNIT I OBJECT-ORIENTED PROGRAMMING – FUNDAMENTALS 9

Review of OOP - Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method – Arrays – Strings – Packages – JavaDoc comments

UNIT II OBJECT-ORIENTED PROGRAMMING – INHERITANCE 9

Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes – the Object class – Reflection – interfaces – object cloning – inner classes – proxies

UNIT III EVENT-DRIVEN PROGRAMMING 9

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images – Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View- Controller design pattern – buttons – layout management – Swing Components

UNITIV GENERICPROGRAMMING 9

Motivationfor genericprogramming–genericclasses –generic methods–genericcodeandvirtual machine–inheritanceandgenerics –reflectionandgenerics –exceptions–exceptionhierarchy–throwing and catching exceptions – StackTrace Elements - assertions – logging

UNITV CONCURRENTPROGRAMMING 9

Multi-threadedprogramming–interruptingthreads–threadstates–threadproperties–thread synchronization–thread-safeCollections–Executors–synchronizers–threadsandevent-drivenprogramming.

TOTAL:45hrs

TEXTBOOK:

1. CayS.HorstmannandGaryCornell,“CoreJava:VolumeI– Fundamentals”,EighthEdition,SunMicrosystems Press, 2008.

REFERENCES:

1. D.M.Dhamdhere,“SystemsProgrammingandOperatingSystems”,SecondRevisedEdition,Tata McGraw-Hill,2000.
2. JohnJ.Donovan“SystemsProgramming”,TataMcGraw-HillEdition,2000.
3. JohnR.Levine,Linkers&Loaders–HarcourtIndiaPvt.Ltd.,MorganKaufmannPublishers,2000.

CSE/SemVII/Electives

SEMESTER-VII(ELECTIVEVI)

22150E73AP-HIGHSPEEDNETWORKS

AIM:

Thiscourseprovidesintroductiontoemerginghighspeednetworktechnologiesandfacilitates thestudentsidentifywherethenewtechnologycanbeusedtoenhanceperformanceofbusinessnetworks.

OBJECTIVES:

- Goodunderstandingofpacket-switchednetworkingconceptsandprinciplesofoperation.
- GoodunderstandingofInternetprotocolsandarchitectures(e.g.,IPprotocolstack).
- Solidfoundationincomputeroperatingsystemsfundamentals.
- Abilitytoperformindependentresearch,analyzefindingsinhighspeednetworks.

UNITI HIGHSPEEDNETWORKS 9

FrameRelayNetworks –Asynchronoustransfer mode– ATMProtocolArchitecture,ATMlogicalConnection,ATMCell–ATMServiceCategories– AAL.HighSpeedLAN’s:FastEthernet, GigabitEthernet, Fibre Channel – Wireless LAN’s: applications, requirements – Architecture of 802.11

UNIT II CONGESTION AND TRAFFIC MANAGEMENT 8

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III TCP AND ATM CONGESTION CONTROL 12

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – Karn's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Framework, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 8

Integrated Services Architecture – Approach, Components, Services – Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT V PROTOCOLS FOR QoS SUPPORT 8

RSVP – Goals & Characteristics, Data Flow, RSVP Operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TOTAL: 45hrs

TEXTBOOK:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002. [Chapter – 4-6, 8, 10, 12, 13, 17, 18]

REFERENCES:

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003

CSE/Sem VII/Electives

22150E73BP-INFORMATION RETRIEVAL TECHNIQUES

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

UNIT I INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The User's Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II MODELING AND RETRIEVAL EVALUATION 9

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations – Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students should be able to:

- Use an open source search engine framework and explore its capabilities
- Apply appropriate method of classification or clustering.
- Design and implement innovative features in a search engine.
- Design and implement a recommender system.

TEXTBOOKS:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, — Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F., Rokach, L., Shapira, B., Kantor, — Recommender Systems Handbook I, First

Edition, 2011.

REFERENCES:

1. C. Manning, P. Raghavan, and H. Schütze, — Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, — Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

CSE/SemVII/Electives

22150E73CP-SOFTWAREPROJECTMANAGEMENT

AIM:

Software Project Management provides insight to the importance of careful project management

OBJECTIVES:

- Understand Project planning and management
- Identify Client management and project definition
- Understand testing based approach to development
- Team management and ongoing schedule tracking

UNIT1 SOFTWAREMANAGEMENT

9

Conventional Software Management - The Waterfall Model - Conventional Software Management Performance. Evolution of Software Economics - Pragmatic Software Cost Estimation. Reducing Software Product Size - Languages - Object-Oriented Methods and Visual Modeling - Reuse. Improving Software Processes - Team Effectiveness - Automation through Software Environments - Achieving Required Quality. Modern Software Management - Transitioning to an Iterative Process

UNIT2 SOFTWAREMANAGEMENTPROCESSFRAMEWORK

9

Life-Cycle Phases - Engineering and Production Stages - Inception Phase - Elaboration Phase - Construction Phase - Transition Phase. Artifacts of the Process - Artifact Sets - Management Set - Engineering Sets - Artifact Evolution over the Life Cycle - Test Artifacts - Management Artifacts - Engineering Artifacts - Pragmatic Artifacts. Model-Based Software Architectures - Management Perspective - Technical Perspective. Workflows of the Process - Software Process Workflows - Iteration Workflows - Checkpoints of the Process.

UNIT3 SOFTWAREMANAGEMENTDISCIPLINES

9

Iterative Process Planning - Work Breakdown Structures - Conventional WBS Issues - Planning Guidelines - Cost and Schedule Estimating Process - Iteration Planning Process. Project Organizations and Responsibilities - Line-of-Business Organizations - Project Organizations - Evolution of Organizations. Process Automation - Tools: Automation Building Blocks - Project Environment - Round-Trip Engineering - Change Management. Project Control and Process Instrumentation - Seven Core Metrics - Management Indicators - Quality Indicators - Pragmatic Software Metrics - Metrics Automation

UNIT4 PROJECTPROFILES 9

Continuous Integration - Early Risk Resolution - Evolutionary Requirements - Teamworkamong Stakeholders - Top 10 Software Management Principles - Software Management BestPractices - Next-Generation Software Economics - Next-Generation Cost Models - ModernSoftware Economics -ModernProcessTransitions

UNIT5PROJECTEXECUTIONANDCLOSURE 9

Review Process – Planning - Overview and Preparation - Group Review Meeting - Reworkand Follow-up–Guidelines forReviews inProjects - AnalysisandControlGuidelines – CaseStudies. Project Monitoring and Control – ProjectTracking - Activities Tracking - DefectTracking - Issues Tracking - Status Reports - Milestone Analysis. DefectAnalysis andPrevention - Process Monitoring and Audit. Project Closure – Analysis - Analysis Report

TOTAL45hrs

TEXTBOOKS:

1. WalkerRoyce,“*SoftwareProjectManagement:AUnifiedFramework*”,Pearson,2000
2. PankajJalote,“*SoftwareProjectManagementinPractice*”,Pearson,2002

REFERENCES:

1. JoelHenry,“*SoftwareProjectManagement:AReal-WorldGuidetoSuccess*”.Pearson,2004.
2. KathySchwalbe,“*InformationTechnologyProjectManagement*”,CourseTechnology,2005

CSE/SemVII/Electives

22150E73DP-CYBERFORENSICS

OBJECTIVES:

- Tolearncomputerforensics
- Tobecomefamiliarwithforensicstools
- Tolearntoanalyzeandvalidateforensicsdata.

UNITI INTRODUCTIONTOCOMPUTERFORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with ComputerCrime. IntroductiontoIdentityTheft &IdentityFraud.TypesofCFtechniques -Incident andincident response methodology - Forensic duplication and investigation. Preparation for IR:Creating response tool kit and IR team. - Forensics TechnologyandSystems- UnderstandingComputer Investigation – Data Acquisition

UNITII EVIDENCECOLLECTIONANDFORENSICSTOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOSSystems.Current Computer Forensics Tools: Software/ Hardware Tools.

UNITIII ANALYSISANDVALIDATION 9

ValidatingForensicsData–DataHidingTechniques–PerformingRemoteAcquisition–
NetworkForensics – EmailInvestigations – CellPhone and Mobile Devices Forensics

UNITIV ETHICAL HACKING 9

IntroductiontoEthicalHacking-FootprintingandReconnaissance-ScanningNetworks-
Enumeration - System Hacking - Malware Threats - Sniffing

UNITV ETHICALHACKINGINWEB 9

SocialEngineering-DenialofService-SessionHijacking-HackingWebservers–Hacking
WebApplications–SQLInjection-HackingWirelessNetworks-HackingMobilePlatforms.

TOTAL:45PERIODS

OUTCOMES:

Attheendofthecourse,thestudentsshouldbeableto:

- Understandthebasicsofcomputerforensics
- Applyanumberofdifferentcomputerforensictoolstoagivenscenario
- Analyzeandvalidateforensicsdata
- Identifythevulnerabilitiesinagivennetworkinfrastructure
- Implementreal-worldhackingtechniquestotestsystemsecurity

TEXTBOOKS:

1. BillNelson,AmeliaPhillips, FrankEnfinger, ChristopherSteuart,
—ComputerForensicsandInvestigationsI, CengageLearning, IndiaEdition, 2016.
2. CEHofficialCertifiedEthicalHackingReviewGuide, WileyIndiaEdition, 2015.

REFERENCES:

1. JohnR. Vacca,—ComputerForensicsI, CengageLearning, 2005
2. MarjieT. Britz,—ComputerForensicsandCyberCrimel: AnIntroductionI, 3rd
Edition, Prentice Hall, 2013.
3. AnkitFadia—EthicalHackingI SecondEdition, MacmillanIndiaLtd, 2006
4. KennethC. Brancik—InsiderComputerFraudI AuerbachPublicationsTaylor&F
rancis Group–2008.



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**DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING**

PROGRAM HANDBOOK

**M.Tech
COMPUTER SCIENCE AND ENGINEERING
[FULLTIME]**

[REGULATION 2022]

[For candidates admitted to M.Tech CSE program from June 2022 onwards]

**DEAN
ENGINEERING AND TECHNOLOGY**

**HOD
DEPT. OF CSE**

COURSESTRUCTURE

SEMESTER- I

Semester. no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
I	22248S11A	HigherMathematics	4	1	0	4
I	22250H12	ModernOperatingSystem	4	0	0	4
I	22250H13	MachineLearningTechniques	4	0	0	4
I	22250H14	AdhocandSensorNetwork	4	0	0	4
I	22250H15	AdvancedDataStructuresandAlgorithms	4	1	0	4
I	22250E16_	Elective-I	3	0	0	3
Practical						
I	22250L17	AdvancedWebTechnologiesLab	-	-	3	3
TotalnoofCredit					26	

SEMESTER- II

Semester. no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
II	22250H21	MiddlewareTechnologies	3	1	0	4
II	22250H22	ObjectOrientedSoftwareEngineering	4	0	0	4
II	22250H23	InternetofThings	4	0	0	4
II	22250E24_	ElectiveII	3	0	0	3
II	22250E25_	Elective-III	3	0	0	3
Practical						
II	22250L26	.NETTechnologies Lab	-	-	3	3
II	222TECWR	TechnicalWriting/Seminars	-	-	3	3
TotalnoofCredit					24	

SEMESTER-III

Semester.no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
III	22250H31	SoftwareProjectManagement	4	0	0	4
III	22250E32_	Elective-IV	3	0	0	3
III	22250E33_	Elective-V	3	0	0	3
III	22250E34_	Elective-VI	3	0	0	3
III	22250P35	ProjectWork-PhaseI*	-	-	10	10
TotalnoofCredit						23

SEMESTER- IV

Semestern o.	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
IV	22250P41	ProjectWork-Phase II*	-	-	15	15
TotalnoofCredit						15

***-Onlyreviewwillbeconducted**

List of Electives Semester-I-Elective-I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	22250E16A	Multimedia Systems	3	0	0	3
I	22250E16B	Web Engineering	3	0	0	3
I	22250E16C	Software Metrics	3	0	0	3

SEMESTER-II-Elective-II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E24A	Advanced Distributed Computing	3	0	0	3
II	22250E24B	Data Warehousing & Data Mining	3	0	0	3
II	22250E24C	Information Retrieval Techniques	3	0	0	3

SEMESTER-II-Elective-III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E25A	Service Oriented Architecture	3	0	0	3
II	22250E25B	High Speed Networks	3	0	0	3
II	22250E25C	Language Technologies	3	0	0	3

SEMESTER–III-Elective–IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E32A	Cloud Computing	3	0	0	3
III	22250E32B	Speech Processing and Synthesis	3	0	0	3
III	22250E32C	Soft Computing	3	0	0	3

SEMESTER–III- Elective–V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E33A	Advanced Database Technology	3	0	0	3
III	22250E33B	Reconfigurable Computing	3	0	0	3
III	22250E33C	Green Computing	3	0	0	3

SEMESTER–III-Elective–VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E34A	Software Quality Assurance	3	0	0	3
III	22250E34B	Bio-inspired Computing	3	0	0	3
III	22250E34C	Wireless Application Protocols	3	0	0	3

CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Total Credits
	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	05	20	01	03	01	03	26
II	03	12	02	06	02	06	24
III	01	04	03	9	01	10	23
IV	-	-	-	-	01	15	15
TOTAL							88

TOTAL CREDITS	
Semester-I	26
Semester-II	24
Semester-III	23
Semester-IV	15
TOTAL	88

22248S11A-HIGHER MATHEMATICS

LTPC3
104

AIM

To extend student's mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

OBJECTIVES

At the end of the course, students would

- Have knowledge of the concepts needed to test the logic of a program.
- Have gained knowledge which has application in expert system, in database and a basic for the prolog language.
- Have an understanding in identifying patterns on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be exposed to concepts and properties of algebraic structures such as semigroups, monoids and groups.

UNIT I SETS, RELATIONS AND FUNCTIONS 9

Basic Concepts – Relationships between sets-Operations on sets-Principles of inclusion and exclusion – Minterms and Maxterms of a set – Relations partial ordering relation-Equivalence relation-Binary relations-Cyclic order relation – $a \equiv b \pmod{m}$ relations: Partitions sets – Hasse diagram- functions: Properties- Composition - inverse function

UNIT II LOGIC 9

Propositional logic – Logical connectivity's-Truth table-Normal forms(Connective and disjunctive)-Predicate logic-Universal and existential quantifiers induction.

UNIT III COMBINATORICS 9

Basic of counting-counting arguments-Pigeonhole principle- Permutations and combinations- Recursion and Recurrence relations - Generating functions.

UNIT IV MODELLING COMPUTATION AND LANGUAGES 9

Finite state machines-Deterministic and Non-Deterministic finite state machines-Turing Machines-Formal Languages-Classes of Grammars-Type_0 – Context Sensitive-Context-Free-Regular Grammars-Ambiguity.

UNIT V LATTICE AND BOOLEAN ALGEBRA 9

Partial order relation, poset-lattices, Hasse diagram-Boolean Algebra

Total No of periods: 45

REFERENCES

1. J.P.Tremblay and R.Manohar, "Discrete Mathematical Structures with Application to Computer Science", TMH, NY-1997
2. M.K.Venkatraman, N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", The National Publishing Company, 2003
3. K.H.Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill Book, 1999.

22250H12-MODERN OPERATING SYSTEM

LTPC4
004

AIM:

To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems, multimedia operating system and recent operating systems.

OBJECTIVES:

- To have an overview of different types of operating systems.
- To know the components of an operating system.
- To have a thorough knowledge of process management.
- To have a thorough knowledge of storage management.
- To know the concepts of I/O and file systems.
- To know the concepts of multimedia operating systems.

UNIT I

9

Introduction – computer hardware review – operating system zoo - Operating System Concepts - System Calls - Operating System Structure -. Process And Threads : Processes – Threads - Interprocess Communication - Scheduling.

Unit II

9

Memory Management Memory Abstraction: Address Spaces, No Memory Abstraction - Virtual Memory - Page Replacement Algorithms - Modeling Page Replacement Algorithms - Design Issues For Paging Systems – Segmentation. File Systems: File Directories File System Implementation

Unit III

9

Deadlocks - Introduction To Deadlocks - The Ostrich Algorithm - Deadlock Detection And Recovery - Deadlock Avoidance - Deadlock Prevention - Other Issues – Input/output Principles of I/O Hardware – Principles of I/O Software – I/O Software Layers – Disks – Clocks – Thin Clients.

Unit IV

9

Multiple processor systems - multiprocessors - multicomputers - virtualization - distributed systems - multimedia operating systems . Multimedia files - video compression audiocompression – multimedia scheduling - disk scheduling for multimedia.

Unit V

9

Case Study – LINUX, WINDOWS VISTA, SYMBIAN OS

Total: 45hrs

TEXTBOOK:

1. Andrew S. Tanenbaum, “Modern Operating Systems“, Pearson Education, 3rd Edition, 2009

REFERENCEBOOKS:

1. Silberschatz, Galvin, Gagne "Operating System Concepts" Sixth Edition, 2003 .
2. Achut S. Godbole and Kahate Atul, "Operating Systems & Systems Programming", Tata McGraw Hill, 2003.
3. Charles Crowley, "Operating systems: A Design Oriented Approach", Tata McGraw Hill, 1999.

22250H13-MACHINELEARNINGTECHNIQUES

L T PC4004

AIM:

The main objective of this paper is to make the student to know the need of Machine Learning Techniques.

OBJECTIVES:

To introduce students to the basic concepts and techniques of Machine Learning.
To have a thorough understanding of the Supervised and Unsupervised learning techniques
To study the various probability based learning techniques
To understand graphical models of machine learning algorithms

UNIT I INTRODUCTION	9
Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.	
UNIT II LINEAR MODELS	9
Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.	
UNIT III TREE AND PROBABILISTIC MODELS	9
Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – Kmeans Algorithms – Vector Quantization – Self Organizing Feature Map	
UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS	9
Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic Algorithms – Genetic Offspring: – Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process	
UNIT V GRAPHICAL MODELS	9
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods	

Total: 45hrs

REFERENCES:

- Ethem Alpaydin, — Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014
- Jason Bell, — Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
- Peter Flach, — Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
- Stephen Marsland, — Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
- Tom M Mitchell, — Machine Learning, First Edition, McGraw Hill Education, 2013.

22250H14–ADHOCANDSENSORNETWORK

LTPC4
004

AIM:

To understand the current and emerging applications of the ad hoc sensor networks.

OBJECTIVE:

To understand

- A broad overview of the state of wireless and ad hoc networking.
- The overview of the physical, networking and architectural issues of ad hoc networks.
- The technologies that will enable the next generation of ad hoc networks and the proliferation of ubiquitous computing.
- The sensor networks and the unique set of design challenges that they introduce.

UNIT I AD-HOC MAC 9

Introduction – Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classification of MAC protocols, Multichannel MAC & Power control MAC protocol.

UNIT II AD-HOC NETWORK ROUTING & TCP 9

Issues – Classification of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

UNIT III WSN-MAC 9

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IV WSN ROUTING, LOCALIZATION & QoS 9

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

UNIT V MESH NETWORKS 9

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

Total: 45 hrs

REFERENCES:

1. C. Siva Ram Murthy and B. Smanoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.
3. C.K. Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002.
4. Thomas Krag and Sebastin Buettlich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.

22250H15-ADVANCED DATA STRUCTURES AND ALGORITHMS

LTPC3
104

AIM:

To make the learner understand the Analysis of algorithms and Data Structures.

OBJECTIVES:

To Understand

- The Different Heap Structures, Search Structures and Multimedia Structures.
- The various coding scheduling and algorithms.
- The various multimedia structures.

UNIT I FUNDAMENTALS: 9+3

Mathematical Induction - Asymptotic Notations - Properties of Big-oh Notation - Conditional Asymptotic Notation - Algorithm Analysis - Amortized Analysis - NP-Completeness - NP-Hard - Recurrence Equations - Solving Recurrence Equations - Memory Representation of Multi-dimensional Arrays - Time-Space Tradeoff.

UNIT II HEAP STRUCTURES: 9+3

Min/Max Heaps - Deaps - Leftist Heaps - Binomial Heaps - Fibonacci Heaps - Skew Heaps - Lazy-Binomial Heaps.

UNIT III SEARCH STRUCTURE: 9+3

Binary Search Trees - AVL Trees - Red-Black trees - Multi-way Search Trees - B-Trees - Splay Trees - Tries.

UNIT IV MULTIMEDIA STRUCTURES: 9+3

Segment Trees - k-d Trees - Point Quad Trees - MX-Quad Trees - R-Trees - TV-Trees.

UNIT V ALGORITHMS: 9+3

Huffman Coding - Convex Hull - Topological Sort - Tree Vertex Splitting - Activity Networks - Flow Shop Scheduling - Counting Binary Trees - Introduction to Randomized Algorithms.

Total: 60hrs

REFERENCES

1. E. Horowitz, S. Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, University Press, 2007.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Prentice-Hall, 1988.
4. V. S. Subramanian, Principles of Multimedia Database Systems, Morgan Kaufman, 1998.

1. Creation of HTML pages with frames, links, tables and other tags.
2. Usage of internal and external CSS along with HTML pages.
3. Client side Programming
 - i. Javascript for displaying date and comparing two dates.
 - ii. Form Validation including text field, radio buttons, checkboxes, list box and other controls.
4. Usage of ASP/JSP objects response, Request, Application, Session, Server, ADO etc.
 - i. Writing online applications such as shopping, railway/air/bus ticket reservations system with set of ASP/JSP pages.
 - ii. Using sessions and cookies as part of the web application.
5. Writing Servlet Program using HTTP Servlet.
6. Any online application with database access.
7. Creation of XML document for a specific domain.
8. Writing DTD or XML schema for the domain specific XML document.
9. Parsing an XML document using DOM and SAX Parsers.
10. Sample web application development in the open source environment.

22250H21-MIDDLEWARETECHNOLOGIES

LTPC3
104

AIM:

The aim of the course is to teach the role of middleware in the distributed environment and its common services.

OBJECTIVES:

- To study the set of services that a middleware system constitutes of.
- To understand how middleware facilitates the development of distributed applications in heterogeneous environments.
- To study how it helps to incorporate application portability, distributed application component interoperability and integration.
- To learn the object oriented middleware basics through the example of the following CORBA objects.
- To understand the basics of Webservices that is the most often-used middleware technique.

UNIT- I 9+3

Introduction : What is a distributed system- Client server Architecture- Multi-tier Architecture- Middleware - Classification of middleware- Event based middleware- Object based Middleware - Message based middleware and its Principal functions- Introduction to concepts of database middleware.

UNIT- II 9+3

RPC & message Passing middleware- Introduction to procedure calls- Principles of RPC Architecture- Structure of Communication - Java RMI

UNIT- III 9+3

Other middleware: Introduction to EJB- Introduction to JDBC & ODBC **Interface Definition Language:** Introduction to specification - IDL Identifiers- Attributes type correction - Classes- Arrays- Documentation - Any type- Modules - Interfaces- Exception handling - pre Compiler Directives - OO Design using IDL.

UNIT- IV 9+3

CORBA: CORBA 2 Standard- Standard Object model- CORBA Architecture- CORBA Client and Object Implementation- Interface & Implementation repository- CORBA Services- Key Issues- Naming Services - Relationships- Event Services- life Cycle services- Object Query Services- properties Services- Time Services- CORBA facilities & CORBA Domains.

UNIT -V 9+3

COM: Classes- Objects- Query Interface- Dynamic Composition- Apartments- In process Activation - Server Lifetime- Server Lifetime- COM Security- Access Control- Token management- Introduction to DCOM.

Total: 60hrs

REFERENCEBOOKS:

1. DanielSerian,“Middleware”,SpringerVerlag,1999.
2. TroyBryanDowning,“JavaRMI:RemoteMethodInvocation”,IDGBooksIndia,2000.
3. ThomasJMowbray&WilliamARuh,“InsideCORBADistributedObjectsandAppli
cation”, Addison Wesley, 1999
4. AlanPope,“CORBACompleteReferenceGuide”,AddisonWesley, 1998.
5. DonBox,“EssentialCom”,AddisonWesley, 1999

22250H22-OBJECTORIENTEDSOFTWAREENGINEERING

AIM:

To learn the advanced software engineering principles and methodologies for effective software development.

OBJECTIVES:

- To learn about software prototyping, analysis and design.
- To learn UML and its usage.
- Case studies to apply the principles.

UNIT-1 INTRODUCTION 8

Software Engineering Paradigms - Software Development process models - Project & Process - Project management – Process & Project metrics - Object Oriented concepts & Principles.

UNIT-2 PLANNING&SCHEDULING 9

Software prototyping - Software project planning – Scope – Resources - Software Estimation - Empirical Estimation Models-Planning-Risk Management - Software Project Scheduling – Object Oriented Estimation & Scheduling.

UNIT-3 ANALYSIS&DESIGN 12

Analysis Modeling - Data Modeling - Functional Modeling & Information Flow-Behavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behaviour Model. Design Concepts & Principles - Design Process - Design Concepts - Modular Design – Design Effective Modularity- Introduction to Software Architecture - Data Design – Transform Mapping – Transaction Mapping – OOD - Design System design process- Object design process -Design Patterns.

UNIT-4 IMPLEMENTATION&TESTING 8

Top-Down, Bottom-Up, object oriented product Implementation & Integration. Software testing methods-White Box, Basis Path-Control Structure –Black Box-Unit Testing- Integration testing- Validation & System testing. Testing OOA & OOD models-Object oriented testing strategies.

UNIT- 5 MAINTENANCE 8

Maintenance process-System documentation-program evolution dynamics-Maintenance costs-Maintainability measurement – Case Studies The laboratory shall include development of systems applying the Software Engineering principles and methods for specific applications.

Total:45 hrs

TEXTBOOKS:

1. Roger S. Pressman, "Software Engineering A Practitioner's Approach", Fifth Edition, Tata McGraw Hill.
2. Grady Booch, James Rumbaugh, Ivar Jacobson – "the Unified Modeling Language User Guide" – Addison Wesley, 1999. (Unit III)

REFERENCEBOOKS:

1. Ian Sommerville, "Software Engineering", 5th Edition Addison-Wesley 1996.
2. Pankaj Jalote "An Integrated Approach to Software Engineering" Narosa Publishing House 1991.
3. Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli "Fundamentals of Software Engineering" Prentice Hall of India 2002.
4. Fairley, "Software Engineering Concepts", Mc. Graw Hill 1985.

22250H23-INTERNETOFTHINGS

LTPC4
004

AIM:

To introduce the student to various IOT techniques.

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.

UNIT I INTRODUCTION TO IoT 9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG-IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE 9

M2M high – level ETSI architecture- IETF architecture for IoT- OGC architecture- IoT Reference model- Domain model- information model- functional model- communication model- IoT Reference architecture To apply the concept to Internet of Things, in the real world scenario.

UNIT III IoT PROTOCOLS 9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BAC Net Protocol – Modbus – Zigbee Architecture – Network layer – 6LoWPAN – CoAP – Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO 9

Building IOT with RASPBERRY PI-IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device - Building blocks - Raspberry Pi-Board - Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python- Other IoT Platforms- Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS 9

Real world design constraints- Applications- Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities- participatory sensing- Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs – Cloud for IoT- Amazon Web Services for IoT.

TOTAL: 45 PERIODS

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, — Internet of Things – A hands-on approach, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), — Architecting the Internet of Things, Springer, 2011.
3. Honbo Zhou, — The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
4. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, — The Internet of Things – Key applications and protocols, Wiley, 2012

22250L26-.NETTECHNOLOGIESLAB

Develop the following in ASP.NET or VB.NET.

1. Query text box and Displaying records
2. Display records by using database
3. Data list link control
4. Data binding using dropdown list control
5. Data grid paging

Develop the following in C#.NET.

1. Demonstrate UseOfVirtual and override keyword in C# with a simple program.
2. Write a program in C# to implement Stack operations.
3. Write a program to demonstrate Operator overloading.
4. Demonstrate arrays of interface types with a C# program.
5. Write a program in C# to build a class which implements an interface which already exists.

22250H31-SOFTWAREPROJECTMANAGEMENT

AIM:

SoftwareProjectManagementprovides insighttotheimportanceofcarefulproject management

OBJECTIVES:

- UnderstandProject planningandmanagement.
- IdentifyClientmanagementandprojectdefinition.
- Understandtestingbasedapproachto development.
- Teammanagementandongoingscheduletracking.

UNITI FUNDAMENTALS 9

ConventionalSoftwareManagement–EvolutionofSoftwareEconomics–ImprovingSoftwareEconomics – Conventional versus Modern Software Project Management.

UNITII SOFTWAREMANAGEMENTPROCESSFRAMEWORK 9

LifecyclePhases–ArtifactsoftheProcess–ModelBasedSoftware Architectures–WorkflowsoftheProcess – Checkpoints of the Process.

UNITIII SOFTWAREMANAGEMENTDISCIPLINES 9

IterativeProcessPlanning –OrganizationandResponsibilities–ProcessAutomation–ProcessControland Process Instrumentation – Tailoring the Process.

UNITIV MANAGEDANDOPTIMIZEDPROCESS 9

DataGatheringand Analysis–PrinciplesofDataGathering–DataGatheringProcess–SoftwareMeasures – Data Analysis – Managing Software Quality – Defect Prevention.

UNITV CASESTUDIES 9

COCOMOCostEstimationModel–ChangeMetrics–CCPDS–R.

Total:45hrs

TEXTBOOKS:

1. WalkerRoyce“SoftwareProjectManagementAUnifiedFramework”,PearsonEducation, 2004
2. HumphreyWatts,“Managingthesoftwareprocess”,AddisonWesley,1989.(UnitIV)

REFERENCES:

1. RameshGopalaswamy,“ManagingGlobalProjects”,TataMcGrawHill,2001.
2. BobHughes,Mikecoterrell,“SoftwareProjectManagement”,3rdEdition,TatacGrawHill, 2004.

SEMESTER-I-ELECTIVE-I22250E16A-MULTIMEDIASYSTEMS

AIM:

To impart knowledge on Multimedia system and design.

OBJECTIVES:

- To study the graphic techniques and algorithms.
- To study the multimedia concepts and various I/O technologies

UNIT I Introduction 9

Line-Curve and Ellipse Drawing Algorithms – Attributes – Two-Dimensional Geometric Transformations – Two-Dimensional Clipping and Viewing.

UNIT II Three-Dimensional Concepts 9

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III Multimedia Systems Design 9

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV Multimedia File Handling 9

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V Hypermedia 9

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

Total: 45 Hours

REFERENCES:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003. (UNIT I : Chapters 1 to 6; UNIT 2: Chapter 9 – 12, 15, 16)
2. Prabat K A and Leigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003. (UNIT 3 to 5)
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. Foley, Van Dam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.

22250E16B-WEBENGINEERING

AIM:

OBJECTIVES:

- Understand the characteristics of web applications
- Learn to Model web applications
- Be aware of Systematic design methods
- Be familiar with the testing techniques for web applications

UNIT I INTRODUCTION TO WEB ENGINEERING 9

Motivation, Categories of Web Applications, Characteristics of Web Applications, Requirements of Engineering in Web Applications- Web Engineering- Components of Web Engineering- Web Engineering Process- Communication- Planning.

UNIT II WEB APPLICATION ARCHITECTURES & MODELLING 9

Introduction- Categorizing Architectures- Specifics of Web Application Architectures, Components of a Generic Web Application Architecture- Layered Architectures, 2-Layer Architectures, N-Layer Architectures- Data-aspect Architectures, Database-centric Architectures- Architectures for Web Document Management- Architectures for Multimedia Data- Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Modelling Framework- Modeling languages- Analysis Modeling for Web Apps- The Content Model- The Interaction Model- Configuration Model.

UNIT III WEB APPLICATION DESIGN 9

Design for Web Apps- Goals- Design Process- Interactive Design- Principles and Guidelines- Workflow- Preliminaries- Design Steps- Usability- Issues- Information Design- Information Architecture- structuring- Accessing Information- Navigation Design- Functional Design- Web App Functionality- Design Process- Functional Architecture- Detailed Functional Design.

UNIT IV TESTING WEB APPLICATIONS 9

Introduction- Fundamentals- Test Specifics in Web Engineering- Test Approaches- Conventional Approaches, Agile Approaches- Testing concepts- Testing Process- Test Scheme- Test Methods and Techniques- Link Testing- Browser Testing- Usability Testing- Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Content Testing- User Interface testing- Usability Testing- Compatibility Testing- Component Level Testing- Navigation Testing- Configuration testing- Security and Performance Testing- Test Automation.

UNIT V PROMOTING WEB APPLICATIONS AND WEB PROJECT MANAGEMENT 9

Introduction- challenges in launching the web Application- Promoting Web Application- Content Management- Usage Analysis- Web Project Management- Challenges in Web Project Management- Managing Web Team- Managing the Development Process of

aWeb Application- Risk, Developing a Schedule, Managing
Quality, Managing Change,

Tracking the Project. Introduction to nodeJS- websockets.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to:

- Explain the characteristics of web applications.
- Model web applications.
- Design web applications.
- Test web applications.

REFERENCES:

1. Chris Bates, — Web Programming: Building Internet Applications, Third Edition, Wiley India Edition, 2007.
2. Gerti Kappel, Birgit Proll, — Web Engineering, John Wiley and Sons Ltd, 2006.
3. Guy W. Lecky-Thompson, — Web Programming, Cengage Learning, 2008.
4. John Paul Mueller, — Web Development with Microsoft Visual Studio 2005, Wiley Dream tech, 2006.
5. Roger S. Pressman, David Lowe, — Web Engineering, Tata McGraw Hill Publication, 2007.

22250E16C-SOFTWARE METRICS

AIM:

To understand software quality metrics.

OBJECTIVES:

- To introduce an integrated approach to software development incorporating quality management methodologies.
- To study about the quality improvements in software
- To understand the Software Quality software standards

UNIT I MEASUREMENTS THEORY

9

-Measurements In Software Engineering- Scope Of Software Metrics- Measurements Theory- Goal Based Framework – Software Measurement Validation.

UNIT II DATA COLLECTION AND ANALYSIS

9

Empirical Investigation- Planning Experiments- Software Metrics Data Collection- Analysis Methods- Statistical Methods.

UNIT III PRODUCT METRICS

9

Measurement Of Internet Product Attributes- Size And Structure - External Product Attributes- Measurement Of Quality.

UNIT IV QUALITY METRICS

9

Software Quality Metrics- Product Quality- Process Quality- Metrics For Software Maintenance- Case Studies Of Metrics Program - Motorola - Hp And IBM.

UNIT V MANAGEMENT METRICS

9

Quality Management Models- Rayleigh Model- Problem Tracking Report (PTR) Model- Reliability Growth Model - Model Evaluation - Orthogonal Classification.

TOTAL=45

REFERENCES:

1. Norman E-

Fentar, Share Lawrence Pflieger, "Software Metrics", International Thomson Computer Press, 1997.

2. Stephen H. Kin, "Metric and Models in Software Quality Engineering", Addison Wesley

SEMESTER-II- ELECTIVE-II

22250E24A-ADVANCED DISTRIBUTED COMPUTING

AIM:

This course discusses the depth concepts of distributed computing and its features.

OBJECTIVES:

Understanding the concepts of

- processing distributed systems, operating system issues.
- learn about distributed transaction
- study about the distributed databases.

UNIT-I INTRODUCTION 9

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies: Ethernet, WiFi.

UNIT-II PROCESSES AND DISTRIBUTED OBJECTS 9

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study: Interprocess communication in UNIX - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Case Study: Java RMI.

UNIT-III OPERATING SYSTEM ISSUES 9

The OS Layer - Protection - Processes and Threads - Communication and Invocation - OS Architecture - Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies Kerberos, 802.11 WiFi - Distributed File Systems - File Service Architecture - Sun Network File System - Distributed Debugging - Distributed Mutual Exclusion - Elections - Multicast Communication Related Problems.

UNIT-IV DISTRIBUTED TRANSACTION PROCESSING 9

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems.

UNIT-V DISTRIBUTED DATABASES 9

Features of Distributed versus Centralized Databases - Principles of Distributed Databases - Level of Distribution - Transparency - Reference Architecture for Distributed Databases - Types of Data Fragmentation - Integrity Constraints in Distributed Databases.

Total: 45hrs

TEXTBOOKS:

- 1 George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Pearson Education, 4th Edition, 2005.
1. Distributed Database Principles & Systems, Stefano Ceri, Giuseppe Pelagatti McGraw-Hill

REFERENCES:

- 1 Sape Mullender, "Distributed Systems", Addison Wesley, 2nd Edition, 1993.
- 2 Albert Fleishman, "Distributed Systems - Software Design and Implementation", Springer-Verlag, 1994.
- 3 M.L. Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004.
- 4 Andrew S Tanenbaum, Maarten van Steen, "Distributed Systems - Principles and Paradigms", Pearson Education, 2002.
- 5 Mughesh Singhal, Niranjana G Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill Edition, 2001.
6. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez - Pearson Education

22250E24B-DATA WAREHOUSING & DATA MINING

AIM:

To serve the students with an emphasis on the design aspects of Data Mining and Data Warehousing

OBJECTIVES:

- To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication. Core topics like classification, clustering and association rules are exhaustively dealt with.
- To introduce the concept of data warehousing with special emphasis on architecture and design.

UNIT-I INTRODUCTION 9

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehousing and Business Analysis: - Data warehousing Components – Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT-II DATA MINING AND ASSOCIATION RULE MINING 9

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.
Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT-III CLASSIFICATION AND PREDICTION 9

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Selection.

UNIT IV CLUSTER ANALYSIS 9

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V MINING OTHER DATA 9

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

TOTAL=45HRS

REFERENCES:

1. Jiawei Han and Micheline Kamber "Data Mining Concepts and Techniques" Second Edition, Elsevier

Reprinted 2008.

2. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw-Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data Mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
4. G.K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

22250E24C-INFORMATIONRETRIEVALTECHNIQUES

LTPC4
004

OBJECTIVES:

- To understand the basics of information retrieval with pertinence modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I INTRODUCTION: MOTIVATION 9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems – History of Web Search – Web Characteristics – The impact of the web on IR – IR Versus Web Search – Components of a Search engine

UNIT II MODELING 9

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking – Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III INDEXING 9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching – Sequential Searching and Pattern Matching. Query Operations – Query Languages – Query Processing – Relevance Feedback and Query Expansion – Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV CLASSIFICATION AND CLUSTERING 9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Metalearning

UNIT V SEARCHING THE WEB 9

Searching the Web – Structure of the Web – IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to:

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Design an efficient search engine and analyze the Web content structure.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, — Introduction to Information Retrieval, Cambridge University Press, First South Asian Edition, 2008.
2. Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, 2010
3. Ricardo Baeza-Yates, Berthier Ribeiro-Neto, — Modern Information Retrieval: The concepts and Technology behind Search (ACM Press Books), Second Edition, 2011.
4. Stefan Butcher, Charles L. A. Clarke, Gordon V. Cormack, — Information Retrieval

22250E25A-SERVICEORIENTEDARCHITECTURE

AIM:

To familiarize the students with the concepts of service oriented architectures. (SOA).

OBJECTIVES:

- Understand SOA, service orientation and web services
- Analyzing and designing business based on SOA principles.
- Learning the concept of XML.

UNIT I

9

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.

UNIT II

9

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

UNIT III

9

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

UNIT IV

9

Metadata management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS Security – Security in web service framework – advanced messaging

UNIT V

9

Transaction processing – paradigm – protocols and coordination – transaction specifications – SOA in mobile – research issues

Total: 45hrs

REFERENCES:

1. Shankar Kambhampaly, "Service-Oriented Architecture for Enterprise Applications", Wiley India Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education.
3. Mark O'Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2003.

22250E25B-HIGHSPEED NETWORKS

AIM:

To study the various performance and analysis issues involved in high-speed data transmission.

OBJECTIVES:

Be able to

- Describe and interpret the basics of high-speed networking technologies.
- Apply the concepts learnt in this course to optimize and troubleshoot high-speed networks.
- Demonstrate the knowledge of network planning and optimization.

UNIT-1 :HIGHSPEED NETWORKS

9

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell-ATM Service Categories-AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11

UNIT-2: CONGESTION AND TRAFFIC MANAGEMENT

9

Queuing Analysis- Queuing Models- Single Server Queues - Effects of Congestion- Congestion Control- Traffic Management- Congestion Control in Packet Switching Networks- Frame Relay Congestion Control.

UNIT-3 :TCP AND ATM CONGESTION CONTROL

9

TCP Flow control- TCP Congestion Control- Retransmission - Timer Management - Exponential RTO backoff- KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM- Requirements- Attributes- Traffic Management Framework, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations- GFR traffic management.

UNIT-4: INTEGRATED AND DIFFERENTIATED SERVICES

9

Integrated Services Architecture- Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services

UNIT-5: PROTOCOLS FOR QoS SUPPORT

9

RSVP- Goals & Characteristics, Data Flow, RSVP Operations, Protocol Mechanisms- Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

Total: 45hrs

TEXTBOOK:

1. William Stallings, "HIGHSPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

REFERENCES:

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003

22250E25C-LANGUAGETECHNOLOGIES

LTPC4
004

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To appreciate the use of CFG and PCFG in NLP
- To understand the role of semantics and pragmatics

UNIT I INTRODUCTION 9

Words-Regular Expressions and Automata- Words and Transducers-N-grams-Part-of-Speech-Tagging-Hidden Markov and Maximum Entropy Models.

UNIT II SPEECH 9

Speech-Phonetics-Speech Synthesis-Automatic Speech Recognition-Speech Recognition:-Advanced Topics-Computational Phonology.

UNIT III SYNTAX 9

Formal Grammar of English-Syntactic Parsing-Statistical Parsing-Features and Unification-Language and Complexity.

UNIT IV SEMANTICS AND PRAGMATICS 9

The Representation of Meaning-Computational Semantics-Lexical Semantics-Computational Lexical Semantics –Computational Discourse.

UNIT V APPLICATIONS 9

Information Extraction- Question Answering and Summarization- Dialogue and Conversational Agents-Machine Translation.

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to:

- To tag given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast use of different statistical approaches for different types of NLP applications.

REFERENCES:

1. Breck Baldwin, "Language Processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.
2. Daniel Jurafsky, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
3. Nitin Indurkha and Fred J. Damerau, "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press, 2010.
4. Richard M Reese, "Natural Language Processing with Java", O_Reilly Media, 2015.
5. Steven Bird, Ewan Klein and Edward Loper, -"Natural Language Processing with Python", First Edition, O_Reilly Media, 326009.

22250E32A-CLOUD COMPUTING

AIM:

To acquire basic knowledge on cloud computing and its applications

OBJECTIVES:

- Identify cloud computing models, characteristics, and technologies.
- Get knowledge about the different architectures in cloud.
- Identify the information about service management and cloud securities.

UNIT-I

9

Overview of Computing Paradigm- Recent trends in Computing - Evolution of cloud computing - Introduction to Cloud Computing - Cloud Computing (NIST Model)- Properties, Characteristics & Disadvantages - Cloud computing vs. Cluster computing vs. Grid computing - Role of Open Standards

UNIT-II

9

Cloud Computing Architecture- Cloud computing stack - Service Models (XaaS)- Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service (SaaS)- Deployment Models

UNIT-III

9

Infrastructure as a Service (IaaS)- Introduction to IaaS- Resource Virtualization - Examples. Platform as a Service (PaaS) - Introduction to PaaS - Cloud Platform and Management - Examples - Software as a Service (SaaS) - Introduction to SaaS

UNIT-IV

9

Service Management in Cloud Computing - Service Level Agreements (SLAs)- Identity & Access Management - Access Control - Trust, Reputation, Risk - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

UNIT-V

9

Cloud Security- Infrastructure Security- Network level security- Host level security- Application level security - Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location - Case Study on Open Source & Commercial Clouds - Eucalyptus - Microsoft Azure - Amazon EC2.

Total: 45hrs

REFERENCEBOOKS:

1. CloudComputingBible,BarrieSosinsky,Wiley-India, 2010
2. CloudComputing:PrinciplesandParadigms,Editors:RajkumarBuyya,JamesBroberg,Andrzej M. Goscinski, Wile, 2011
3. CloudComputing:Principles,SystemsandApplications,Editors:NikosAntonopoulos,LeeGillam, Springer, 2012
4. CloudSecurity:AComprehensiveGuidetoSecureCloudComputing,RonaldL.Krutz,Russell Dean Vines, Wiley-India, 2010

22250E32B-SPEECH PROCESSING AND SYNTHESIS

AIM:

To study about the Speech Processing and Synthesis

OBJECTIVES

To understand the mathematical foundations needed for speech processing

To understand the basic concepts and algorithms of speech processing and synthesis

To familiarize the students with the various speech signal representation, coding and recognition techniques

To appreciate the use of speech processing in current technologies and to expose the students to real-world applications of speech processing

UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction–Spoken Language Structure–Phonetics and Phonology–Syllables and Words–Syntax and Semantics–Probability, Statistics and Information Theory–Probability Theory–Estimation Theory–Significance Testing–Information Theory.

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing–Speech Signal Representations–Shorttime Fourier Analysis–Acoustic Model of Speech Production–Linear Predictive Coding–Cepstral Processing–Formant Frequencies–The Role of Pitch–Speech Coding–LPC Coder.

UNIT III SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues–Limitations. Acoustic Modeling–Variability in the Speech Signal–Extracting Features–Phonetic Modeling–Adaptive Techniques–Confidence Measures–Other Techniques.

UNIT IV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation–Morphological Analysis–Letter-to-sound Conversion–Prosody–Generationschematic–Speaking Style–Symbolic Prosody–Duration Assignment–Pitch Generation

UNIT V SPEECH SYNTHESIS 9

Attributes–Formant Speech Synthesis–Concatenative Speech Synthesis–Prosodic Modification of Speech–Source-filter Models for Prosody Modification–Evaluation of TTS Systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Joseph Mariani, —Language and Speech Processing, Wiley, 2009.
2. Lawrence Rabiner and Biing-Hwang Juang, —Fundamentals of Speech Recognition, Prentice Hall Signal Processing Series, 1993.
3. Sadaoki Furui, —Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications), Marcel Dekker, 2000.
4. Thomas F. Quatieri, —Discrete-Time Speech Signal Processing, Pearson Education, 2002.

22250E32C-SOFTCOMPUTING

AIM:

To understand the concepts of Artificial Intelligence, ANN, Genetic Algorithms and Fuzzy systems and its applications.

OBJECTIVES:

- To introduce the ideas of Neural networks, fuzzy logic and use of heuristics based on human experience.
- To have general understanding of soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy clustering techniques and genetic algorithms;
- To Design and development of certain scientific and commercial application using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.

UNIT-I FUZZY SET THEORY

10

Introduction to Neuro-Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT-II OPTIMIZATION

8

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT-III NEURAL NETWORKS

10

Supervised Learning Neural Networks – Perceptrons – Adaline – Backpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT-IV NEUROFUZZY MODELING

9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V APPLICATION OF COMPUTATIONAL INTELLIGENCE

8

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Total: 45hrs

TEXTBOOK:

1. J.S.R.Jang,C.T.SunandE.Mizutani, “Neuro FuzzyandSoft Computing”,PHI,PearsonEducation, 2004.

REFERENCES:

1. TimothyJ.Ross,“FuzzyLogicwithEngineeringApplication“,McGrawHill, 1977.
2. DavisE.Goldberg,“GeneticAlgorithmsSearch,OptimizationandMachineLearning”,Addison Wesley, 1989.
3. S.RajasekaranandG.A.V.Pai,“NeuralNetworks,FuzzyLogicandGeneticAlgorithms”,PHI,2003.
4. R.Bernaert,P.SimpsonandR.Dobbins,“ComputationalIntelligencePCTools”,APP
rofessional, Boston, 1996.

AIM:

To prepare the student to understand, develop, and manage more advanced database applications.

OBJECTIVES:

Be able to

Know the operations of parallel and distributed databases.

Understand the structures and standards of object relational databases.

Get familiar with the concepts of XML, Mobile and Multimedia Databases.

UNIT-I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems – Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture – Case Studies.

UNIT-II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational features in SQL/Oracle – Case Studies.

UNIT-III XML DATABASES 9

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT-IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols - Mobile Database Recovery Schemes.

UNIT-V MULTIMEDIA DATABASES 9

Multidimensional Data Structures – Image Databases – Text/Document Databases – Video Databases – Audio Databases – Multimedia Database Design.

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006.
4. C.J. Date, A. Kannan and S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

22250E33B-RECONFIGURABLE COMPUTING

AIM:

To understand about the Reconfigurable Computing.

OBJECTIVES:

- To understand the need for reconfigurable computing
- To expose the student to various device architectures
- To examine the various reconfigurable computing systems
- To understand the different types of compute models for programming reconfigurable architectures
- To expose the student to HDL programming and familiarize with the development environment
- To expose the student to the various placement and routing protocols
- To develop applications with FPGAs

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing – Simple Programmable Logic Devices – Complex Programmable Logic Devices – FPGAs – Device Architecture – Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures – RPF Integration into Traditional Computing Systems – Reconfigurable Computing Systems – Case Studies – Reconfiguration Management.

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

Compute Models – Programming FPGA Applications in HDL – Compiling C for Spatial Computing – Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGN TO RECONFIGURABLE PLATFORMS 9

The Design Flow – Technology Mapping – FPGA Placement and Routing – Configuration Bitstream Generation – Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGAS 9

Case Studies of FPGA Applications – System on a Programmable Chip (SoPC) Designs.

TOTAL: 45 PERIODS

REFERENCES:

1. Christophe Bobda, — Introduction to Reconfigurable Computing – Architectures, Algorithms and Applications, Springer, 2010.
2. Maya B. Gokhale and Paul S. Graham, — Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays, Springer, 2005.
3. FPGA Frontiers: New Applications in Reconfigurable Computing, 2017, Nicole Hemsoth, Timothy Prickett Morgan, Next Platform.
4. Reconfigurable Computing: From FPGA to Hardware/Software Codesign 2011 Edition by Joao Cardoso (Editor), Michael Hübner, Springer

5. Scott Hauck and Andre Dehon (Eds.), — Reconfigurable Computing—
The Theory and Practice of FPGA-
Based Computation, Elsevier/Morgan Kaufmann, 2008.

22250E33C-GREENCOMPUTING

AIM:

To Understand Green Technology and to implement Green computing practices to efficiently use the computers and its resources.

OBJECTIVES:

- Understanding scientific and social environment.
- Minimizing energy consumption from the IT estate.
- Purchasing green energy and using green suppliers.
- Reducing the paper and other consumables used.
- Minimizing equipment disposal requirements.

UNIT-I 9
Origins, Regulations and industry initiatives - Government, Industry.

UNIT-II 9
Approaches to green computing - Product longevity, Algorithmic efficiency.

UNIT-III 9
Resource allocation, Virtualization.

UNIT-IV 9
Terminal servers, Power management, Operating systems support, Power supply, Storage, Video card, Display.

UNIT-V 9
Web, Temporal and Spatial Data Mining, Materials recycling, Telecommuting, Middleware support for green computing, Tools for monitoring, HPC computing, Green Mobile, embedded computing and networking, Management Frameworks Standards and metrics for computing green

Total: 45hrs

REFERENCES:

1. Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting by Jason Harris.
2. Green IT: Reduce Your Information System's Environmental Impact While Adding to the Bottom Line. By Toby Velte (Author), Anthony Velte (Author), Robert Elsenpeter (Author), MC-Graw Hill
3. The Greening of IT - How Companies Can Make a Difference for the Environment by John Lamb.

22250E34A-SOFTWAREQUALITYASSURANCE

AIM:

To develop the ability to analyze and estimate the quality of the software.

OBJECTIVES:

- To introduce an integrated approach to software development incorporating quality management methodologies.
- To study about the quality improvements in software.
- To understand the Software Quality software standards.

UNIT I

9

Introduction to software quality - challenges – objectives – quality factors – components of SQA – contract review – development and quality plans – SQA components in project life cycle – SQA defect removal policies – Reviews

UNIT II

9

Basics of software testing – test generation from requirements – finite state models – combinatorial designs – test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement

UNIT III

9

Testing strategies – white box and black box approach – integration testing – system and acceptance testing – performance testing – regression testing – internationalization testing – ad hoc testing – website testing – usability testing – accessibility testing Test plan – management – execution and reporting – software test automation – automated testing tools

UNIT IV

9

Hierarchical models of software quality – software quality metrics – function points – Software product quality – software maintenance quality – effect of case tools – software quality infrastructure – procedures – certifications – configuration management – documentation control.

UNIT V

9

Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

Total=45hrs

REFERENCES

1. Daniel Galin, Software quality assurance – from theory to implementation, Pearson education, 2009.
2. Aditya Mathur, Foundations of software testing, Pearson Education, 2008.
3. Srinivasan Desikan and Gopalaswamy Ramesh, Software testing – principles and practices, Pearson education, 2006.
4. Ron Patton, Software Testing, second edition, Pearson education, 2007.

19250E34B-Bio-Informatics

AIM:

To impart knowledge on basic techniques of Bioinformatics.

OBJECTIVES:

- Build a solid foundation and acquire the vocabulary you need to supervise or to communicate with others who use these tools.
- To have ability to design drugs.
- To understand Evolutionary Trees and Phylogeny.
- Learn the key methods and tools used in bioinformatics.

UNIT I FUNDAMENTALS 7

The Central Dogma – Killer Application – Parallel Universes – Watson’s Definition – Top Down Vs Bottom Up Approach – Information Flow – Conversance – Communications.

UNIT II DATABASE AND NETWORKS 9

Definition – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks Communication Models – Transmission Technology – Protocols – Bandwidth – Topology – Contents – Security – Ownership – Implementation.

UNIT III SEARCH ENGINES AND DATA VISUALIZATION 10

Search Process – Technologies – Searching and Information Theory – Computational Methods – Knowledge Management – Sequence Visualizations – Structure Visualizations – User Interfaces – Animation Vs Simulation.

UNIT IV STATISTICS – DATA MINING AND PATTERN MATCHING 11

Statistical Concepts – Micro Arrays – Imperfect Data – Basics – Quantifying – Randomness – Data Analysis – Tools Selection – Alignment – Clustering – Classification – Data Mining Methods – Technology – Infrastructure Pattern Recognition – Discovery – Machine Learning – Text Mining – Pattern Matching Fundamentals – Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools.

UNIT V MODELING SIMULATION AND COLLABORATIONS 8

Drug Discovery Fundamentals – Protein Structure – System Biology Tools – Collaboration and Communication – Standards – Issues – Case Study.

Total: 45hrs

TEXTBOOK:

1. Bryan Bergeron, “Bioinformatics Computing”, Prentice Hall, 2003. RE

REFERENCES:

1. T.K. Affward, D.J. Parry Smith, “Introduction to Bio Informatics”, Pearson Education, 2001.
2. Pierre Baldi, Soren Brunak, “Bioinformatics The Machine Learning Approach”, 2nd Edition, First East West Press, 2003.

22250E34C-WIRELESSAPPLICATIONPROTOCOLS

AIM:

To introduce the advanced element in the field of wireless communication.

OBJECTIVE:

- Be able to discuss current and emerging technology in Wireless technology.
- Understand fundamental trends of technological evolution of Wireless technology.
- Have hands-on knowledge in developing simple and comprehensive WAP contents.
- Be able to create simple Wireless applications.

UNIT-I: 9

Wireless Concepts-Technologies-An Overview of WAP-WAP Application Environment -WAP Gateways - WAP Gateway Services and Security.

UNIT-II: 9

WAP Components-Specification-Standard Execution Environment -Agent Characters-

Main Protocols - WTP/WSP/WDP(UDP/WMP Transport and WTLS Protocol)

UNIT- III: 9

WAP Design and Development -The Development Tools-WML Language- WML Script Language

UNIT-IV: 9

Implementing an Enterprise WAP Strategy, Wireless transmission-Spread spectrum-MAC-SDMA - FDMA - TDMA - CDMA - Cellular Wireless Networks.

UNIT-V: 9

Application Area of WAP: Wireless Operator's Interrelated Services-Mailbox Management-

Searching the Phone Directory - Managing Personal Information.

Total:45hrs

TEXTBOOKS:

1. Steve Mann & Scott Sbihli, -Wireless Application Protocols-Wiley Computer Publishing-2000
2. S.Ruseyev-WAP Technology & Applications-Easwar Press-2003

REFERENCE BOOKS:

1. Sandeep Singhal, Jari Alwinen., -The Wireless Application Protocol: Writing Applications for the Mobile Internet - Addison Wesley Publications - 2000

RESEARCH INTEGRATED CURRICULUM

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the students; both have their justification in the common pursuit of knowledge.

Integrating research skills or Inquiry based learning becomes apparent to meet the changing needs of learners and their teachers, professional practice and society. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital.

Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability these are some of the terms that mark out the world of the twenty-first century.

Teaching and research is correlated when they are co-related suggests that one way of achieving this is to 'exploit further the link between teaching and research in the design of curricula.

Growing out of the research on Teaching- Research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions to analyze their curricula and consider ways of strengthening students understanding through research.

The Curriculum can be:

Research–Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research-Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

- Level1:PrescribedResearch
- Level2:BoundedResearch
- Level3:ScaffoldedResearch
- Level4:SelfactuatedResearch
- Level5:OpenResearch

Taking into consideration the above mentioned facts in respect of integrating research into the B.Tech. (CSE) curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSBCourses	Credits
I	ResearchLedSeminar	1
II	ResearchMethodology	3
II	Participation inBoundedResearch	2
III	DesignProject/ SocioTechnicalProject (Scaffolded Research)	4
IV	ProjectWork	12

➤ **Blueprint for assessment of student's performance in Research Led Seminar Course**

● **Internal Assessment: 40Marks**

- Seminar Report(UG)/Concept Note(PG) :5X4=20Marks
- Seminar Review Presentation :10Marks
- Literature Survey :10Marks

● **Semester Examination: 60Marks**

(Essay type Questions set by the concerned resource persons)

➤ **Blueprint for assessment of student's performance in Design Project**

● **Continuous Internal Assessment through Reviews: 40Marks**

- Review I : 10Marks
- Review II : 10Marks

● ReviewIII : 20Marks

● EvaluationofSocioTechnicalPracticumFinalReport: 40Marks

● Viva-VoceExamination: 20Marks

● Total: 100Marks

➤ **Blueprintforassessmentofstudent'sperformanceinResearchMethodologyCourses**

ContinuousInternalAssessment: 20Marks

● ResearchTools(Lab) : 10 Marks

● Tutorial : 10 Marks

ModelPaperWriting: 40Marks

● Abstract : 5 Marks

● Introduction : 10Marks

● Discussion : 10Marks

● ReviewofLiterature : 5 Marks

● Presentation : 10 Marks

SemesterExamination: 40 Marks

Total: 100 Marks



**PRISTUNIVERSITY
VALLAM, THANJAVUR.**

**DEPARTMENT OF
COMPUTERSCIENCE&ENGINEERING
PROGRAMHANDBOOK**

**M.Tech
COMPUTERSCIENCEANDENGINEERING
[PARTTIME]**

**[REGULATION2022]
[forcandidatesadmittedtoM.TechCSEprogramfromJune 2017onwards]**

**DEAN
ENGINEERINGANDTECHNOLOGY**

**HOD
DEPT.OFCSE**

COURSESTRUCTURE

SEMESTER-I

Semester. no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
I	22248S11AP	HigherMathematics	4	1	0	4
I	22250H12P	Adhoc&SensorNetworks	4	0	0	4
I	22250H13P	AdvancedDataStructures	4	0	0	4
Practical						
I	22250L14P	AdvancedWebTechnologies Lab	-	-	3	3
TotalnoofCredits						15

SEMESTER-II

Semester. no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
II	22250H21P	MiddlewareTechnologies	3	1	0	4
II	22250H22P	InternetofThings	4	0	0	4
II	22250E23_P	Elective I	3	0	0	3
Practical						
II	22250L24P	.NETTechnologies Lab	-	-	3	3
II	222TECWRP	TechnicalWriting/Seminars	-	-	3	3
TotalnoofCredits						17

SEMESTER-III

Semester.no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
III	22250H31P	ModernOperatingSystem	4	0	0	4
III	22250E32P	MachineLearningTechniques	4	0	0	4
III	22250E33_P	Elective-II	3	0	0	3
TotalnoofCredits						11

SEMESTER-IV

Semestern o.	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
IV	22250H41P	ObjectOrientedSoftwareEngineeri ng	4	0	0	4
IV	22250H42P	SoftwareProjectManagement	4	0	0	4
IV	22250E43_P	Elective-V	3	0	0	3
IV	22250P44P	Project Work-PhaseI	-	-	6	10
TotalnoofCredits						21

SEMESTER-V

Semestern o.	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
V	22250E51_P	Elective-IV	3	0	0	3
V	22250E52_P	Elective-V	3	0	0	3
V	22250E53_P	Elective-VI	3	0	0	3
TotalnoofCredits						9

SEMESTER-VI

Semestern o.	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
VI	22250P61P	Project Work-PhaseII	0	0	15	15
TotalnoofCredits						15

LIST OF ELECTIVES

SEMESTER-II ELECTIVE-I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E23AP	Advanced Distributed Computing	3	0	0	3
II	22250E23BP	Data Warehousing & Data Mining	3	0	0	3
II	22250E23CP	Information Retrieval Techniques	3	0	0	3

SEMESTER-III ELECTIVE-II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E33AP	Multimedia Systems	3	0	0	3
III	22250E33BP	Web Engineering	3	0	0	3
III	22250E33CP	Software Metrics	3	0	0	3

SEMESTER-IV-ELECTIVE-III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E43AP	Service Oriented Architecture	3	0	0	3
II	22250E43BP	High Speed Networks	3	0	0	3
II	22250E43CP	Language Technologies	3	0	0	3

SEMESTER-V-ELECTIVE-IV

Semester no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
III	22250E51AP	CloudComputing	3	0	0	3
III	22250E51BP	SpeechProcessingandSynthesis	3	0	0	3
III	22250E51CP	SoftComputing	3	0	0	3

SEMESTER-V-ELECTIVE-V

Semester no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
III	22250E52AP	AdvancedDatabaseTechnology	3	0	0	3
III	22250E52BP	ReconfigurableComputing	3	0	0	3
III	22250E52CP	GreenComputing	3	0	0	3

SEMESTER-V-ELECTIVE-VI

Semester no	SubjectCode	SubjectTitle	Periods perWeek			C
			L	T	P	
III	22250E53AP	SoftwareQualityAssurance	3	0	0	3
III	22250E53BP	Bio-inspiredComputing	3	0	0	3
III	22250E53CP	WirelessApplicationProtocols	3	0	0	3

CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Project	Total Credit
	Nos	Credit	Nos	Credit	Nos	Credit	Credit	
I	3	12	-	-	1	03	-	15
II	2	08	1	03	2	06	-	17
III	2	08	1	03	-	-	-	11
IV	2	08	1	03	1	-	10	21
V	-	-	3	9	-	-	-	9
VI	-	-	-	-	-	-	15	15
TOTAL	9	36	6	18	3	9	21	87
TOTALCREDITS								88

TOTALCREDITS	
Semester-I	15
Semester-II	17
Semester-III	11
Semester-IV	21
Semester-V	9
Semester-VI	15
TOTAL	88

22248S11AP-HIGHER MATHEMATICS

LTPC3
104

AIM

To extend student's mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

OBJECTIVES

At the end of the course, students would

- Have knowledge of the concepts needed to test the logic of a program.
- Have gained knowledge which has application in expert system, in database and basic for the prolog language.
- Have an understanding in identifying patterns on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be exposed to concepts and properties of algebraic structures such as semigroups, monoids and groups.

UNIT I SETS, RELATIONS AND FUNCTIONS

9

Basic Concepts – Relationships between sets-Operations on sets-Principles of inclusion and exclusion – Min terms and Max terms of a set – Relations partial ordering relation-Equivalence relation-Binary relations-Cyclic order relation – $a \equiv b \pmod{m}$ relations: Partitions sets – Hasse diagram- functions: Properties- Composition - inverse function

UNIT II LOGIC

9

Propositional logic – Logical connectivity's-Truth table-Normal forms(Connective and disjunctive)-Predicate logic-Universal and existential quantifiers induction.

UNIT III COMBINATORICS

9

Basic of counting- counting arguments -Pigeonhole principle -Permutations and combinations - Recursion and Recurrence relations - Generating functions.

UNIT IV MODELLING COMPUTATION AND LANGUAGES

9

Finite state machines-Deterministic and Non-Deterministic finite state machines-Turing Machines-Formal Languages-Classes of Grammars-Type_0 – Context Sensitive-Context-Free-Regular Grammars-Ambiguity.

UNIT V LATTICE AND BOOLEAN ALGEBRA

9

Partial order relation, poset-lattices, Hasse diagram-Boolean Algebra

Total No of periods: 45

REFERENCES:

1. J.P.Tremblay and R.Manohar, "Discrete Mathematical Structures with Application to Computer Science", TMH, NY-1997
2. M.K.Venkatraman, N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", The National Publishing Company, 2003
3. K.H.Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill Book, 1999.

CSE/Semester-I

22250H12P-ADHOC&SENSORNETWORKS

LTPC

AIM:

To understand the current and emerging applications of the ad hoc sensor networks.

OBJECTIVE:

To understand

- A broad overview of the state of wireless and ad hoc networking.
- The overview of the physical, networking and architectural issues of ad hoc networks.
- The technologies that will enable the next generation of ad hoc networks and the proliferation of ubiquitous computing.
- The sensor networks and the unique set of design challenges that they introduce.

UNIT I AD-HOC MAC

9

Introduction – Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classification of MAC protocols, Multichannel MAC & Power control MAC protocol.

UNIT II AD-HOC NETWORK ROUTING & TCP

9

Issues – Classification of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

UNIT III WSN-MAC

9

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IV WSN ROUTING, LOCALIZATION & QoS

9

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

UNIT V MESH NETWORKS

9

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

Total: 45hrs

REFERENCES:

1. C. Siva Ram Murthy and B. Smanoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufmann Publishers, 2004.
3. C. K. Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002.
4. Thomas Krag and Sebastin Buettlich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.

22250H13P-ADVANCED DATA STRUCTURES

LTPC3
104

AIM:

To make the learner understand the Analysis of algorithms and Data Structures.

OBJECTIVES:

To Understand

- The Different Heap Structures, Search Structures and Multimedia Structures.
- The various coding scheduling and algorithms.
- The various multimedia structures.

UNIT I FUNDAMENTALS: 9+3

Mathematical Induction - Asymptotic Notations - Properties of Big-oh Notation - Conditional Asymptotic Notation - Algorithm Analysis - Amortized Analysis - NP-Completeness - NP-Hard - Recurrence Equations - Solving Recurrence Equations - Memory Representation of Multi-dimensional Arrays - Time-Space Tradeoff.

UNIT II HEAP STRUCTURES: 9+3

Min/Max heaps - Deaps - Leftist Heaps - Binomial Heaps - Fibonacci Heaps - Skew Heaps - Lazy-Binomial Heaps.

UNIT III SEARCH STRUCTURE: 9+3

Binary Search Trees - AVL Trees - Red-Black trees - Multi-way Search Trees - B-Trees - Splay Trees - Tries.

UNIT IV MULTIMEDIA STRUCTURES: 9+3

Segment Trees - k-d Trees - Point Quad Trees - MX-Quad Trees - R-Trees - TV-Trees.

UNIT V ALGORITHMS: 9+3

Huffman Coding - Convex Hull - Topological Sort - Tree Vertex Splitting - Activity Networks - Flow Shop Scheduling - Counting Binary Trees - Introduction to Randomized Algorithms.

Total: 60hrs

REFERENCES

1. E. Horowitz, S. Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2007.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Prentice-Hall, 1988.
4. V.S. Subramanian, Principles of Multimedia Database systems, Morgan Kaufman, 1998

1. Creation of HTML pages with frames, links, tables and other tags.
2. Usage of internal and external CSS along with HTML pages.
3. Client side Programming
 - i. Javascript for displaying date and comparing two dates.
 - ii. Form Validation including text field, radio buttons, checkboxes, list box and other controls.
4. Usage of ASP/JSP objects response, Request, Application, Session, Server, ADO etc.
 - i. Writing online applications such as shopping, railway/air/bus ticket reservations system with set of ASP/JSP pages.
 - ii. Using sessions and cookies as part of the web application.
5. Writing Servlet Program using HTTP Servlet.
6. Any online application with database access.
7. Creation of XML document for a specific domain.
8. Writing DTD or XML schema for the domain specific XML document.
9. Parsing an XML document using DOM and SAX Parsers.
10. Sample web application development in the open source environment.

22250H21P-MIDDLEWARETECHNOLOGIES

LTPC3
104

AIM:

Theaimofthecourse istoteachthe roleofmiddleware inthe distributedenvironment anditscommons services.

OBJECTIVES:

- Tostudythesetofservices thatamiddlewaresystemconstitutesof.
- Tounderstandhowmiddlewarefacilitatesthedevelopmentofdistributedapplicationsinheterogeneous environments.
- Tostudyhowwithhelptoincorporateapplicationportability,distributedapplicationcomponent interoperability and integration.
- TolearntheobjectorientedmiddlewarebasicsthroughtheexampleofthefollowingCORBA objects.
- TounderstandthebasicsofWebservices thatisthemostoften-used middleware technique.

UNIT- I

9+3

Introduction : What isa distributed system- Client server Architecture – Multi-tierArchitecture-Middleware - Classificationofmiddleware- Event based middleware-Object based Middleware - Message based middleware and its Principal functions- Introduction to concepts of databasemiddleware.

UNIT- II

9+3

RPC&messagePassingmiddleware-Introductiontoprocedurecalls-PrinciplesofRPCArchitecture-Structure of Communication - Java RMI

UNIT- III

9+3

Other middleware: Introduction to EJB- Introduction to JDBC &ODBC **Interface DefinitionLanguage:** Introduction to specification - IDL Identifiers-Attributes type correction - Classes-Arrays- Documentation -Any type-Modules -Interfaces- Exceptionhandling -pre CompilerDirectives -OO Design using IDL.



UNIT -V

9+3

COM: Classes- Objects-Query Interface-Dynamic Composition-Apartments-In processActivation -Server Lifetime-Server Lifetime-COM Security-Access Control-Tokenmanagement- Introduction to DCOM.

Total:60hrs

REFERENCEBOOKS:

1. DanielSerian,“Middleware”,SpringerVerlag,1999.
2. TroyBryanDowning,“JavaRMI: RemoteMethodInvocation”,IDG BooksIndia,2000.
3. ThomasJMowbray&WilliamARuh,“InsideCORBADistributedObjectsandAppli
cation”, Addison Wesley, 1999.
4. AlanPope,“CORBACompleteReferenceGuide”,AddisonWesley,1998.
5. DonBox,“EssentialCom”,AddisonWesley,1999

22250H22P-INTERNETOFTHINGS

LTPC4
004

AIM:

To introduce the student to various IOT techniques.

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific Iots - IoT and M2M - IoT System Management with NETCONF-YANG-IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE

M2M high-level IETSI architecture-IETF architecture for IoT-OGC architecture-IoT reference model-Domain model-information model-functional model-communication model- IoT reference architecture

UNIT III IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus–Zigbee Architecture–Network layer–6LoWPAN-CoAP-Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

Building IOT with RASPBERRY PI-IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi -Raspberry Pi Interfaces -Programming Raspberry Pi with Python- Other IoT Platforms- Arduino

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS

Real world design constraints-Applications- Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities- participatory sensing-Data Analytics for IoT –Software & Management Tools for IoT Cloud Storage Models & Communication APIs– Cloud for IoT-Amazon Web Services for IoT

TOTAL: 45 PERIODS

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015

2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), — Architecting the Internet of Things I, Springer, 2011.
3. Honbo Zhou, — The Internet of Things in the Cloud: A Middleware Perspective I, CRC Press, 2012.
4. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things- Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, — The Internet of Things – Key applications and Protocols I, Wiley, 2012

Develop the following in ASP.NET or VB.NET.

1. Query text box and displaying records
2. Display records by using database
3. Data list link control
4. Data binding using dropdown list control
5. Data grid paging

Develop the following in C#.NET.

1. Demonstrate UseOfVirtual and override keyword in C# with a simple program.
2. Write a program in C# to implement Stack operations.
3. Write a program to demonstrate Operator overloading.
4. Demonstrate array of interface types with a C# program.
5. Write a program in C# to build a class which implements an interface which already exists.

22250H31P-MODERN OPERATING SYSTEM

LTPC4
004

AIM:

To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems, multimedia operating system and recent operating systems.

OBJECTIVES:

- To have an overview of different types of operating systems.
- To know the components of an operating system.
- To have a thorough knowledge of process management.
- To have a thorough knowledge of storage management.
- To know the concepts of I/O and file systems.
- To know the concepts of multimedia operating systems.

UNIT I

9

Introduction – computer hardware review – operating system zoo - Operating System Concepts - System Calls - Operating System Structure -.Process And Threads : Processes – Threads - Interprocess Communication - Scheduling.

Unit II

9

Memory Management Memory Abstraction: Address Spaces, No Memory Abstraction - Virtual Memory - Page Replacement Algorithms - Modeling Page Replacement Algorithms - Design Issues For Paging Systems – Segmentation. File Systems: File Directories File System Implementation

Unit III

9

Deadlocks - Introduction To Deadlocks - The Ostrich Algorithm - Deadlock Detection And Recovery - Deadlock Avoidance - Deadlock Prevention - Other Issues – Input/output Principles of I/O Hardware – Principles of I/O Software – I/O Software Layers – Disks – Clocks – Thin Clients.

Unit IV

9

Multiple processor systems - multiprocessors - multicomputers - virtualization - distributed systems - multimedia operating systems . Multimedia files - video compression audiocompression – multimedia scheduling - disk scheduling for multimedia.

Unit V

9

Case Study – LINUX, WINDOWS VISTA, SYMBIAN OS

Total: 45hrs

TEXTBOOK:

1. Andrew S. Tanenbaum, “Modern Operating Systems“, Pearson Education, 3rd Edition, 2009

REFERENCEBOOKS:

1. Silberschatz, Galvin, Gagne "Operating System Concepts" Sixth Edition, 2003 .
2. Achut S. Godbole and Kahate Atul, "Operating Systems & Systems Programming", Tata McGraw Hill, 2003.
3. Charles Crowley, "Operating systems: A Design Oriented Approach", Tata McGraw Hill, 1999.

22250E32P-MACHINELEARNINGTECHNIQUES

AIM:

The main objective of this paper is to make the students to know the need of Machine Learning Techniques.

OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms

UNIT I INTRODUCTION 9
Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Linear Separability – Linear Regression.

UNIT II LINEAR MODELS 9
Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT III TREE AND PROBABILISTIC MODELS 9
Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS 9
Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

UNIT V GRAPHICAL MODELS 9
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Total: 45 hrs

REFERENCES:

Ethem Alpaydin, — Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

Jason Bell, — Machine learning –

Handson for Developers and Technical Professionals, First Edition, Wiley, 2014

Peter Flach, — Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.

Stephen Marsland, — Machine Learning –

An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Tom M Mitchell, — Machine Learning, First Edition, McGraw Hill Education, 2013.

22250H41P-OBJECTORIENTEDSOFTWAREENGINEERING

LTPC40

04

AIM:

To learn the advanced software engineering principles and methodologies for Effective software development.

OBJECTIVES:

- To learn about software prototyping, analysis and design.
- To learn UML and its usage.
- Case studies to apply the principles.

UNIT-1 INTRODUCTION 8

Software Engineering Paradigms-Software Development process models-Project & Process-Project management – Process & Project metrics - Object Oriented concepts & Principles.

UNIT-2 PLANNING&SCHEDULING 9

Software prototyping - Software project planning – Scope – Resources - Software Estimation - Empirical Estimation Models-Planning-Risk Management - Software Project Scheduling – Object Oriented Estimation & Scheduling.

UNIT-4 IMPLEMENTATION&TESTING 8

Top-Down, Bottom-Up, object oriented product Implementation & Integration. Software testing methods-White Box, Basis Path-Control Structure –Black Box-Unit Testing-Integration testing-Validation & System testing. Testing OOA & OOD models-Object oriented testing strategies.

UNIT- 5 MAINTENANCE 8

Maintenance process-System documentation-program evolution dynamics-Maintenance costs-Maintainability measurement – Case Studies The laboratory shall include development of systems applying the Software Engineering principles and methods for specific applications.

Total:45 hrs

TEXTBOOKS:

1. Roger S. Pressman, "Software Engineering A Practitioner's Approach", Fifth Edition, Tata McGraw Hill.
2. Grady Booch, James Rumbaugh, Ivar Jacobson – "the Unified Modeling Language User Guide" – Addison Wesley, 1999. (Unit III)

REFERENCE BOOKS:

1. Ian Sommerville, "Software Engineering", V Edition Addison-Wesley 1996.
2. Pankaj Jalote "An Integrated Approach to Software Engineering" Narosa Publishing House 1991
3. Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli "Fundamentals of Software Engineering" Prentice Hall of India 2002.
4. Fairley, "Software Engineering Concepts", Mc. Graw Hill 1985.

22250H42P-SOFTWAREPROJECTMANAGEMENT

LTPC4
004

AIM:

SoftwareProjectManagementprovidesinsighttotheimportanceofcarefulprojectmanagem
ent

OBJECTIVES:

- UnderstandProject planningandmanagement.
- IdentifyClientmanagementandprojectdefinition.
- Understandtestingbasedapproachtodevelopment.
- Teammanagementandongoingscheduletracking.

UNIT I FUNDAMENTALS 9

ConventionalSoftwareManagement –EvolutionofSoftwareEconomics –
ImprovingSoftwareEconomics – Conventional versus Modern Software Project Management.

UNIT II SOFTWAREMANAGEMENTPROCESS FRAMEWORK 9

LifecyclePhases–ArtifactsoftheProcess–ModelBasedSoftwareArchitectures –Workflowsof the
Process – Checkpoints of the Process.

UNIT III SOFTWAREMANAGEMENTDISCIPLINES 9

IterativeProcessPlanning –OrganizationandResponsibilities–ProcessAutomation–
ProcessControl and Process Instrumentation – Tailoring the Process.

UNIT IV CASE STUDIES 9

COCOMOCostEstimationModel–ChangeMetrics–CCPDS–R.

Total:45hrs

TEXTBOOKS:

1. WalkerRoyce“SoftwareProjectManagementAUnifiedFramework”,PearsonEducation, 2004
2. HumphreyWatts,“Managingthesoftwareprocess”,AddisonWesley,1989.(UnitIV)

REFERENCES:

1. RameshGopaldaswamy,“ManagingGlobalProjects”, TataMcGrawHill, 2001.
2. BobHughes,Mikecotterell,“SoftwareProject Management”,3rdEdition,TatacGrawHill, 2004.

22250CRM-RESEARCHMETHODOLOGY

AIM

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in basic computational and excel- skills for research in engineering.

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I

Introduction to Research—Criteria of Good Research, Research Problem: Definition of research problem, selecting the problem- Necessity of defining the problem- Techniques involved in defining the problem- Basic principles of experimental designs- Descriptive and experimental design—different types of experimental design – Validity of findings—internal and external validity—Variables in Research—Measurement and Scaling—Different scales. Ethics & Misconduct in research, Plagiarism,

UNIT II

Formulation of Hypothesis—Sampling techniques—Sampling error and sample size- Methods of data collection—Primary and secondary data—observation—Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection- Processing and analysis of data— editing – coding – transcription – tabulation – outline of statistical analysis.

UNIT III

Data Analysis using Excel- Tabulation of Data in excel (Creating Master Table and Sub Table), Formulas and Functions, Filters and Sort and Validation Lists, Data from External Sources. Data Analysis Using Charts and Graphs (Pivot Table & Charts), Time Value of Money, Measure of

central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, regression lines. Z-test, t-test F-test, ANOVA one way classification, Chi square test, independence of attributes. Time series: forecasting Method of least squares, Moving average method, Introduction to presentation tool, features and functions, Creating Presentation, Customizing presentation.

UNIT IV

Various research methods- Design of Experiments, Response Surface Methodology, Taguchi Methods- Modeling & Simulation of Engineering Systems, Artificial Neural Networks, Fuzzy Logic, MATLAB - Graph Theory- Finite Element Methods, Computational Fluid Dynamics - R programming in Statistics- open source software

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references

References:

1. C.R.Kothari, Research Methodology, New Age International Publishers, New Delhi, 2004.
2. Rajammal.P.Devadas, 1976, A handbook of methodology of research, RMM Vidyalaya Press.
3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
4. R.Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. W.J.DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.
6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

SEMESTER -I - ELECTIVE -I22250E23AP - ADVANCED DISTRIBUTED COMPUTING

LTPC4
004

AIM:

This course discusses the depth concepts of distributed computing and its features.

OBJECTIVES:

Understanding the concept of

- processing distributed systems, operating system issues
- learn about distributed transaction
- study about the distributed databases.

UNIT-I INTRODUCTION 9

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies: Ethernet, WiFi.

UNIT-II PROCESSES AND DISTRIBUTED OBJECTS 9

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study: Interprocess communication in UNIX - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Case Study: Java RMI.

UNIT-III OPERATING SYSTEM ISSUES 9

The OS Layer - Protection - Processes and Threads - Communication and Invocation - OS Architecture - Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies Kerberos, 802.11 WiFi- Distributed File Systems- File Service Architecture - Sun Network File System - Distributed Debugging - Distributed Mutual Exclusion - Elections - Multicast Communication Related Problems.

UNIT-IV DISTRIBUTED TRANSACTION PROCESSING 9

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems.

UNIT-V DISTRIBUTED DATABASES 9

Features of Distributed versus Centralized Databases - Principles of Distributed Databases - Levels of Distribution Transparency - Reference Architecture for Distributed Databases - Types of Data Fragmentation - Integrity Constraints in Distributed Databases.

Total: 45hrs

TEXTBOOKS:

1 George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Pearson Education, 4th Edition, 2005.

1. Distributed Database Principles & Systems, Stefano Ceri, Giuseppe Pelagatti McGraw-Hill

REFERENCES:

1 Sape Mullender, "Distributed Systems", Addison Wesley, 2nd Edition, 1993.

2 Albert Fleishman, "Distributed Systems - Software Design and Implementation", Springer-Verlag, 1994.

3 M.L. Liu, "Distributed Computing Principles and Applications", Pearson Education, 2004.

4 Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems - Principles and Paradigms", Pearson Education, 2002.

5 Mugesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill Edition, 2001.

6. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez - Pearson Education

22250E23BP-DATA WAREHOUSING & DATA MINING

LTPC4004

AIM:

To serve the students with an emphasis on the design aspect of Data Mining and Data Warehousing.

OBJECTIVES:

- To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication. Core topics like classification, clustering and association rules are exhaustively dealt with.
- To introduce the concept of data warehousing with special emphasis on architecture and design.

UNIT-I INTRODUCTION 9

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehousing and Business Analysis: - Data warehousing Components – Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT-II DATA MINING AND ASSOCIATION RULE MINING 9

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT-III CLASSIFICATION AND PREDICTION 9

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV CLUSTER ANALYSIS 9

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

REFERENCES:

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw– Hill Edition, Tenth Reprint 2007.
3. K.P.Soman, Shyam Diwakar and V. Ajay “Insight into Data Mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G.K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

AIM:

To give out the students with an importance on the various aspects of artificial neural networks.

OBJECTIVES:

- To introduce the concepts of artificial neural networks such as biological neural networks, clustering and structures
- To study the linear models for regression, classification, kernel methods and feedforward neural networks

UNIT-I Introduction to artificial neural networks 9

Biological neural networks - Pattern analysis tasks: Classification, Regression, Clustering - Computational model of neurons - Structures of neural networks - Learning principles.

UNIT-II Linear models for regression and classification 9

Polynomial curve fitting - Bayesian curve fitting - Linear basis function models - Bias - variance decomposition - Bayesian linear regression - Least squares for classification - Logistic regression for classification - Bayesian logistic regression for classification

UNIT-III Feedforward neural networks 9

Pattern classification using perception - Multilayer feed forward neural networks (MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back propagation learning - Fast learning methods: Conjugate gradient method - Auto associative neural networks - Bayesian neural networks.

UNIT-IV Kernel methods for pattern analysis 9

Statistical learning theory - Support vector machines for pattern classification - Support vector regression for function approximation - Relevance vector machines for classification and regression - **Self-organizing maps:** Pattern clustering - Topological mapping - Kohonen's self-organizing map.

UNIT-V Feedback neural networks 9

Pattern storage and retrieval - Hopfield model - Boltzmann machine - Recurrent neural networks.

Total: 45 hrs**TEXTBOOKS:**

1. B. Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999
2. Satish Kumar, Neural Networks - A Classroom Approach, Tata McGraw-Hill, 2003
3. S. Haykin, Neural Networks - A Comprehensive Foundation, Prentice Hall, 1998

SEMESTER -III -ELECTIVE-

II22250E33AP-MULTIMEDIASYSTEMS

LTPC4
004

AIM:

To impart knowledge on Multimedia system and design.

OBJECTIVES:

- To study the graphic techniques and algorithms.
- To study the multimedia concepts and various I/O technologies

UNIT I Introduction 9

Line-Curve and Ellipse Drawing Algorithms – Attributes – Two-Dimensional Geometric Transformations – Two-Dimensional Clipping and Viewing.

UNIT II Three-Dimensional Concepts 9

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III Multimedia Systems Design 9

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV Multimedia File Handling 9

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V Hypermedia 9

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

Total: 45 Hours

REFERENCES:

- Donald Hearn and M. Pauline Baker, “Computer Graphics C Version”, Pearson Education, 2003. (UNIT I : Chapters 1 to 6; UNIT 2: Chapter 9 – 12, 15, 16)
- Prabat Kandleigh and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003. (UNIT 3 to 5)
- Judith Jeffcoate, “Multimedia in practice technology and Applications”, PHI, 1998.
- Foley, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”, Pearson Education, second edition 2003.

22250E33BP-GENETICALGORITHMS

LTPC4
004

AIM:

To make the students learn the fundamentals of Genetic Algorithms and search technique used in computing.

OBJECTIVES:

1. Understand and be able to apply fundamental GA theory.
2. be able to implement or modify simple genetic algorithms.
3. be able to apply GA to problems in the student's field.
4. to find exact or approximate solutions to optimization and search problems.

UNIT-I

9

Introduction : A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms. Genetic Algorithms in Scientific models - Evolving computer programs, data analysis & prediction, evolving neural networks, modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

UNIT-II

9

Theoretical Foundation of genetic algorithm : Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical-Mechanics Approaches.

UNIT-III

9

Computer Implementation of Genetic Algorithm: Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

UNIT-IV

9

Some applications of genetic algorithms : The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms

UNIT-V

9

Advanced operators & techniques in genetic search: Dominance, duplicity, & abeyance, inversion & other reordering operators, other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

Total: 45hrs

TEXTBOOKS:

1. David E. Goldberg, "Genetic Algorithms in search, optimization & Machine Learning" Pears

on Education, 2006

REFERENCEBOOKS:

1. Melanie Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.
2. Michael D. Vose, "The simple genetic algorithm foundations and theory", Prentice Hall India, 1999.
3. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", Kluwer Academic Publisher, 2001
4. D. Quagliarella, J. Periaux, C. Poloni & G. Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997

22250E33CP-SOFTWAREMETRICS

LTPC4
004

AIM:

To understand software quality metrics.

OBJECTIVES:

- To introduce an integrated approach to software development incorporating quality management methodologies.
- To study about the quality improvements in software
- To understand the Software Quality software standards

UNIT I MEASUREMENTS THEORY 9

- Measurements In Software Engineering - Scope Of Software Metrics - Measurements Theory - Goal Based Framework – Software Measurement Validation.

UNIT II DATA COLLECTION AND ANALYSIS 9

Empirical Investigation - Planning Experiments - Software Metrics Data Collection - Analysis Methods – Statistical Methods.

UNIT III PRODUCT METRICS 9

Measurement Of Internet Product Attributes - Size And Structure - External Product Attributes - Measurement Of Quality.

UNIT IV QUALITY METRICS 9

Software Quality Metrics - Product Quality - Process Quality - Metrics For Software Maintenance - Case Studies Of Metrics Program - Motorola - Hp And IBM.

UNIT V MANAGEMENT METRICS 9
Quality Management Models - Rayleigh Model - Problem Tracking Report (PTR) Model - Reliability Growth Model - Model Evaluation - Orthogonal Classification.

TOTAL=45

REFERENCES:

- Norman E - Fenton, Share Lawrence Pflieger, "Software Metrics", International Thomson Computer Press, 1997.
- Stephen H. Kin, "Metric and Models in Software Quality Engineering", Addison Wesley

SEMESTER-IV-ELECTIVE-III

22250E43AP-SERVICEORIENTEDARCHITECTURE

AIM:

To familiarize the students with the concepts of service oriented architectures. (SOA)

OBJECTIVES:

- Understand SOA, service orientation and web services
- Analyzing and designing business based on SOA principles.
- Learning the concepts of XML.

UNIT I

9

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.

UNIT II

9

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

UNIT III

9

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

UNIT IV

9

Transaction processing – paradigm – protocols and coordination – transactions specifications – SOA in mobile – research issues

Total: 45 hrs

REFERENCES:

1. Shankar Kambhampaly, "Service-Oriented Architecture for Enterprise Applications", Wiley India Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education.
3. Mark O'Neill, et al., "Web Services Security", Tata McGraw-Hill Edition, 2003.

AIM:

To study the various performance and analysis issues involved in high-speed data transmission.

OBJECTIVES:

Be able to

- Describe and interpret the basics of high-speed networking technologies.
- Apply the concepts learnt in this course to optimize and troubleshoot high-speed network.
- Demonstrate the knowledge of network planning and optimization

UNIT-1:HIGHSPEED NETWORKS**9**

Frame Relay Networks-Asynchronous transfer mode- ATM Protocol Architecture, ATM Logical Connection, ATM Cell- ATM Service Categories- AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11

UNIT- 2: CONGESTION AND TRAFFIC MANAGEMENT**9**

Queuing Analysis-Queuing Models-Single Server Queues-Effect of Congestion- Congestion Control- Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

UNIT-3:TCP AND ATM CONGESTION CONTROL**9**

TCP Flow control- TCP Congestion Control- Retransmission- Timer Management - Exponential RTT backoff- KARN's Algorithm- Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes- Traffic Management Framework, Traffic Control- ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

UNIT- 4: INTEGRATED AND DIFFERENTIATED SERVICES**9**

Integrated Services Architecture- Approach, Components, Services- Queuing Discipline, FQ, PS, BRfq, GPS, WFQ - Random Early Detection, Differentiated Services

UNIT-5: PROTOCOLS FOR QoS SUPPORT**9**

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching- Operations, Label Stacking, Protocol details- RTP- Protocol Architecture, Data Transfer Protocol, RTCP.

Total: 45 hrs**TEXTBOOK:**

1. William Stallings, "HIGHSPEED NETWORKS AND INTERNET", Pearson Education,

Second Edition, 2002.

REFERENCES:

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003

22250E43CP- EMBEDDED SYSTEMS LTPC4004

AIM:

To give sufficient background for embedded systems design.

OBJECTIVES:

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real-time operating systems, inter-task communication and an exemplary case of MUCOS – IRTOS.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

UNIT-II DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - ‘12C’, ‘USB’, ‘CAN’ and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

UNIT-III EMBEDDED PROGRAMMING 9

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions - Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of EMBEDDED PROGRAMMING in C++ - Object Oriented Programming – Embedded Programming in C++, ‘C’ Program compilers – Cross compiler – Optimization of memory codes.

UNIT-IV REAL TIME OPERATING SYSTEMS – PART-1 9

OS Services – Interrupt Routines Handling, Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics - Inter Process Communication And Synchronisation – Shared data problem– Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – RPCs.

UNIT-V REAL TIME OPERATING SYSTEMS – PART-2 9

Study of RTOS, VxWorks - Basic Features - Task Management Library at the System - LibraryHeader File - VxWorks System Functions and System Tasks - Inter Process (Task)Communication Functions - Case Study of Coding for Sending Application Layer Byte Streamson a TCP/IP Network Using RTOS Vxworks

Total:45hrs

REFERENCE:

1. Rajkamal,EmbeddedSystemsArchitecture,ProgrammingandDesign,TATAMcGrawHill,First reprint 2003
2. DavidE.Simon,AnEmbeddedSoftwarePrimer,PearsonEducationAsia,First Indian Reprint 2000.

SEMESTER-V-ELECTIVE-IV

22250E51AP-CLOUD COMPUTING

LTPC4004

AIM

To acquire basic knowledge on cloud computing and its applications.

OBJECTIVES:

- Identify cloud computing models, characteristics, and technologies.
- Get knowledge about the different architectures in cloud.
- Identify the information about service management and cloud securities.

UNIT-I

9

Overview of Computing Paradigm- Recent trends in Computing - Evolution of cloud computing - Introduction to Cloud Computing - Cloud Computing (NIST Model)- Properties, Characteristics & Disadvantages - Cloud computing vs. Cluster computing vs. Grid computing - Role of Open Standards

UNIT-II

9

Cloud Computing Architecture - Cloud computing stack - Service Models (XaaS) - Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service (SaaS)- Deployment Models

UNIT-III

9

Infrastructure as a Service (IaaS) - Introduction to IaaS- Resource Virtualization - Examples. Platform as a Service (PaaS) - Introduction to PaaS - Cloud Platform and Management - Examples - Software as a Service (SaaS)- Introduction to SaaS

UNIT-IV

9

Service Management in Cloud Computing - Service Level Agreements (SLAs)- Identity & Access Management - Access Control - Trust, Reputation, Risk - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

UNIT-V

9

Cloud Security - Infrastructure Security - Network level security - Host level security - Application level security - Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location - Case Study on Open Source & Commercial Clouds - Eucalyptus - Microsoft Azure - Amazon EC2

Total: 45hrs

REFERENCE BOOKS:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

22250E51BP-SPEECH PROCESSING AND SYNTHESIS LTPC4004

AIM

To study about the Speech Processing and Synthesis

OBJECTIVES

- To understand the mathematical foundations needed for speech processing
- To understand the basic concepts and algorithms of speech processing and synthesis
- To familiarize the students with the various speech signal representation, coding and recognition techniques
- To appreciate the use of speech processing in current technologies and to expose the students to real-world applications of speech processing

UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral Processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

UNIT III SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques.

UNIT IV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation Schematic – Speaking Style – Symbolic Prosody – Duration Assignment – Pitch Generation

UNIT V SPEECH SYNTHESIS 9

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Joseph Mariani, — Language and Speech Processing, Wiley, 2009.
2. Lawrence Rabiner and Bing-Hwang Juang, — Fundamentals of Speech Recognition, Prentice Hall Signal Processing Series, 1993.
3. Sadaoki Furui, — Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications), Marcel Dekker, 2000.
4. Thomas F. Quatieri, — Discrete-Time Speech Signal Processing, Pearson Education, 2002.
5. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, — Spoken Language Processing – A Guide to Theory, Algorithm and System Development, Prentice Hall PTR, 2001.

AIM:

To understand the concepts of Artificial Intelligence, ANN, Genetic Algorithms and Fuzzy systems and its applications.

OBJECTIVES:

- To introduce the ideas of Neural networks, fuzzy logic and use of heuristics based on human experience.
- To have a general understanding of soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy clustering techniques and genetic algorithms;
- To design and development of certain scientific and commercial applications using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.

UNIT-I FUZZY SET THEORY**10**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT-II OPTIMIZATION**8**

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT-III NEURAL NETWORKS**10**

Supervised Learning Neural Networks – Perceptrons – Adaline – Backpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT-IV NEURO FUZZY MODELING**9**

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V APPLICATION OF COMPUTATIONAL INTELLIGENCE**8**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Total: 45 hrs

TEXTBOOK:

1. J.S.R.Jang,C.T.SunandE.Mizutani,“Neuro FuzzyandSoft Computing”,PHI,PearsonEducation, 2004.

REFERENCES:

1. TimothyJ.Ross,“FuzzyLogicwithEngineeringApplication“,McGrawHill,1977.
2. DavisE.Goldberg,“GeneticAlgorithmsSearch,OptimizationandMachineLearning”,Addison Wesley, 1989.
3. S.RajasekaranandG.A.V.Pai,“NeuralNetworks,FuzzyLogicandGenetic Algorithms”,PHI, 2003.
4. R.Eberhart,P.SimpsonandR.Dobbins,“ComputationalIntelligencePCTools”,APProfessional, Boston, 1996.

SEMESTER-V-ELECTIVE-V

22250E52AP-ADVANCED DATABASE TECHNOLOGY

LTPC4
004

AIM:

To prepare the student to understand, develop, and manage more advanced database applications.

OBJECTIVES:

Be able to

- Know the operations of parallel and distributed databases.
- Understand the structures and standards of object relational databases.
- Get familiar with the concepts of XML, Mobile and Multimedia Databases.

UNIT-I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture-Case Studies.

UNIT-II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT-III XML DATABASES 9

XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT-IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols - Mobile Database Recovery Schemes.

UNIT-V MULTIMEDIA DATABASES 9

Multidimensional Data Structures – Image Databases – Text/Document Databases - Video Databases – Audio Databases – Multimedia Database Design.

Total=45hrs

REFERENCES:

1. R.Elmasri,S.B.Navathe,“FundamentalsofDatabaseSystems”,FifthEdition,PearsonEducation/Addison Wesley, 2007.
2. ThomasCannollyandCarolynBegg,“DatabaseSystems,APracticalApproachtoDesign,Implementation and Management”, Third Edition, Pearson Education,2007.
3. HenryFKorth,AbrahamSilberschatz,S.Sudharshan,“DatabaseSystemConcepts”,FifthEdition, McGraw Hill, 2006.
4. C.J.Date,A.KannanandS.Swamynathan,“AnIntroductiontoDatabaseSystems”,EighthEdition, Pearson Education, 2006.

22250E52BP-RECONFIGURABLE COMPUTING

LTPC4
004

AIM:

To understand about the Reconfigurable Computing.

OBJECTIVES:

- To understand the need for reconfigurable computing
- To expose the student to various device architectures
- To examine the various reconfigurable computing systems
- To understand the different types of compute models for programming reconfigurable architectures
- To expose the student to HDL programming and familiarize with the development environment
- To expose the student to the various placement and routing protocols
- To develop applications with FPGAs

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing –
Simple Programmable Logic Devices – Complex Programmable Logic Devices – FPGAs –
Device Architecture – Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures – RPF Integration into Traditional Computing Systems –
Reconfigurable Computing Systems – Case Studies – Reconfiguration Management.

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

Compute Models – Programming FPGA Applications in HDL –
Compiling C for Spatial Computing
– Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGN TO RECONFIGURABLE PLATFORMS 9

The Design Flow – Technology Mapping – FPGA Placement and Routing –
Configuration Bitstream Generation – Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGAS 9

Case Studies of FPGA Applications – System on a Programmable Chip (SoPC) Designs.

TOTAL: 45 PERIODS

REFERENCES:

1. Christophe Bobda, — Introduction to Reconfigurable Computing –
Architectures, Algorithms and Applications, Springer, 2010.
2. Maya B. Gokhale and Paul S. Graham, — Reconfigurable Computing: Accelerating
Computation with Field-Programmable

- Gate Arrays, Springer, 2005.
3. FPGA Frontiers: New Applications in Reconfigurable Computing, 2017, Nicole Hemsoth, Timothy Prickett Morgan, Next Platform.
4. Reconfigurable Computing: From FPGA to Hardware/Software Codesign 2011 Edition by Joao Cardoso (Editor), Michael Hübner, Springer
5. Scott Hauck and Andre Dehon (Eds.), — Reconfigurable Computing— The Theory and Practice of FPGA-Based Computation, Elsevier/Morgan Kaufmann, 2008.

AIM:

To Understand Green Technology and to implement Green computing practices to efficiently use the computers and its resources.

OBJECTIVES:

- Understanding scientific and social environment.
- Minimizing energy consumption from the IT estate.
- Purchasing green energy and using green suppliers.
- Reducing the paper and other consumables used.
- Minimizing equipment disposal requirements.

UNIT-I **9**

Origins, Regulations and industry initiatives - Government, Industry.

UNIT-II **9**

Approaches to green computing - Product longevity, Algorithmic efficiency.

UNIT-III **9**

Resource allocation, Virtualization.

UNIT-IV **9**

Terminal servers, Power management, Operating systems support, Power supply, Storage, Videocard, Display.

UNIT-V **9**

Web, Temporal and Spatial Data Mining, Materials recycling, Telecommuting, Middleware support for green computing, Tools for monitoring, HPC computing, Green Mobile, embedded computing and networking, Management Frameworks, Standards and metrics for computing green

Total: 45hrs

REFERENCES:

1. Green Computing and Green IT Best Practices on Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting by Jason Harris.
2. Green IT: Reduce Your Information System's Environmental Impact While Adding to the Bottom Line. By Toby Velte (Author), Anthony Velte (Author), Robert Elsenpeter (Author), MC-Grow Hill.
3. The Greening of IT-How Companies Can Make a Difference for the Environment by John Lamb.

SEMESTER-V-ELECTIVE-VI

22250E53AP-SOFTWAREQUALITYASSURANCE

LTPC4
004

AIM:

To develop the ability to analyze and estimate the quality of the software.

OBJECTIVES:

- To introduce an integrated approach to software development incorporating quality management methodologies.
- To study about the quality improvements in software
- To understand the Software Quality software standards

UNIT I

9

Introduction to software quality - challenges – objectives – quality factors – components of SQA – contract review – development and quality plans – SQA components in project life cycle – SQA defect removal policies – Reviews

UNIT II

9

Basics of software testing – test generation from requirements – finite state models – combinatorial designs - test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement

UNIT III

9

Testing strategies – white box and black box approach – integration testing – system and acceptance testing – performance testing – regression testing – internationalization testing – ad hoc testing – website testing – usability testing – accessibility testing Test plan – management – execution and reporting – software test automation – automated testing tools

UNIT IV

9

Hierarchical models of software quality – software quality metrics – function points – Software product quality – software maintenance quality – effect of case tools – software quality infrastructure – procedures – certifications – configuration management – documentation control

UNIT V

9

Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

Total=45hrs

REFERENCES

1. Daniel Galin, Software quality assurance – from theory to implementation, Pearson education, 2009
2. Aditya Mathur, Foundations of software testing, Pearson Education, 2008.
3. Srinivasan Desikan and Gopalaswamy Ramesh, Software testing – principles and practices, Pearson education, 2006.
4. Ron Patton, Software Testing, second edition, Pearson education, 2007.

22250E53BP-BIO-INFORMATICS LTPC4004

AIM:

To impart knowledge on basic techniques of Bioinformatics.

OBJECTIVES:

- Build a solid foundation and acquire the vocabulary you need to supervise or to communicate with others who use these tools.
- To have ability to design drugs.
- To understand Evolutionary Trees and Phylogeny.
- Learn the key methods and tools used in bioinformatics.

UNIT I FUNDAMENTALS 7

The Central Dogma – Killer Application – Parallel Universes – Watson’s Definition – Top Down Vs Bottom Up Approach – Information Flow – Conversance – Communications.

UNIT II DATABASE AND NETWORKS 9

Definition – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks Communication Models – Transmission Technology – Protocols – Bandwidth – Topology – Contents – Security – Ownership – Implementation.

UNIT III SEARCH ENGINES AND DATA VISUALIZATION 10

Search Process – Technologies – Searching and Information Theory – Computational Methods – Knowledge Management – Sequence Visualizations – Structure Visualizations – User Interfaces – Animation Vs Simulation.

UNIT IV STATISTICS – DATA MINING AND PATTERN MATCHING 11

Statistical Concepts – Micro Arrays – Imperfect Data – Basics – Quantifying – Randomness – Data Analysis – Tools Selection – Alignment – Clustering – Classification – Data Mining Methods – Technology – Infrastructure Pattern Recognition – Discovery – Machine Learning – Text Mining – Pattern Matching Fundamentals – Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools.

UNIT V MODELING SIMULATION AND COLLABORATION 8

Drug Discovery Fundamentals – Protein Structure – System Biology Tools – Collaboration and Communication – Standards – Issues – Case Study.

Total: 45hrs

TEXTBOOK:

1. Bryan Bergeron, “Bioinformatics Computing”, Prentice Hall, 2003.

REFERENCES:

1. T.K. Affward, D.J. Parry Smith, “Introduction to Bio Informatics”, Pearson Education, 2001.
2. Pierre Baldi, Soren Brunak, “Bioinformatics The Machine Learning Approach”, 2nd Edition

on, First East West Press, 2003.

22250E53CP-WIRELESSAPPLICATIONPROTOCOLS

LTPC4
004

AIM

To introduce the advanced element in the field of wireless communication.

OBJECTIVE:

- Be able to discuss current and emerging technology in Wireless technology.
- Understand fundamental trends of technological evolution of Wireless technology.
- Have hands-on knowledge in developing simple and comprehensive WAP contents.
- Be able to create simple Wireless applications.

UNIT-I: 9

Wireless Concepts - Technologies - An Overview of WAP - WAP Application Environment - WAP Gateways - WAP Gateway Services and Security.

UNIT-II: 9

WAP Components - Specification - Standard Execution Environment - Agent Characters - Main Protocols - WTP/WSP/WDP (UDP/WEMP Transportation and WTLS Protocol).

UNIT-III: 9

WAP Design and Development - The Development Tools - WML Language - WML Script Language.

UNIT-IV: 9

Implementing an Enterprise WAP Strategy, Wireless transmission - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA - Cellular Wireless Networks.

UNIT-V: 9

Application Area of WAP: Wireless Operator's Interrelated Services - Mailbox Management - Searching the Phone Directory - Managing Personal Information.

Total: 45hrs

TEXTBOOKS:

1. Steve Mann & Scott Sbihli, - Wireless Application Protocols - Wiley Computer Publishing - 2000
2. S. Rusev, - WAP Technology & Applications - Easwar Press - 2003.

REFERENCE BOOKS:

1. Sandeep Singh, Jari Alwinen., - The Wireless Application Protocol: Writing Applications for the Mobile Internet - Addison Wesley Publications - 2000.



PRIST
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UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

B.COM PROGRAMME

2020 REGULATION

Commerce is a professional course among the various arts subjects. Commerce is instrumental in bringing about changes in all aspects of the society. It promotes growth and development. The changes in the economic policies of the country and the computer application in business offer variety of opportunities for innovative and creative people to carry out their career with new vigor and enthusiasm.

In the present scenario the market based system has gradually expanded across the world securing a strong position in the market overcoming all borders and barriers.

The rapid changes in the field of economics, information technology, politics and also in the organizational structure and the increased complexities of the business world poses series of problems to the modern commerce student. At this backdrop the new syllabus is designed for the B.Com Programme of the **PRIST UNIVERSITY**



SCHOOL OF COMMERCE AND BUSINESS MANAGEMENT

DEPARTMENT OF COMMERCE

B.Com., -REGULATION 2020

COURSESTRUCTURE

SEMESTER-I

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami-I/AdvancedEnglish-I/Hindi-I/ French-I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20161SEC13	BasicAccounting	4	1	0	4
20161SEC14	BusinessEnvironment	3	1	0	3
20161AEC15	Marketing	3	0	0	3
20161AEC16	BusinessEconomics	3	1	3	3
	Total	21	3	3	17
AUDITCOURSE					
201LSCIC	IndianConstitution	1	1	1	2
201LSCUV	UniversalHumanValues	1	1	1	2

SEMESTER-II

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil-II/AdvancedEnglish-II/Hindi-II/ French-II	4	0	0	2
20111AEC22	English-II	4	0	0	2

20161SEC23	BusinessAccounting	4	1	1	4
20161SEC24	EthicsinBusiness	3	1	1	3
20161AEC25	BusinessStatistics	3	1	1	3
20161SEC26	BusinessOrganizationandManagement	3	0	0	3
RESEARCH SKILLBASEDCOURSE					
20161RLC27	ResearchLedSeminar	1	1	1	1
	Total	21	3	3	18
AUDITCOURSES					
201LSCCS	CommunicationSkills	1	1	1	2
201SSCBE	Basic BehavioralEtiquette	1	1	1	2

SEMESTER-III

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil-III/Hindi-III/AdvancedEnglish-III/French-III	4	0	0	2
20111AEC32	English-III	4	0	0	2
20161SEC33	CostAccounting	2	1	2	4
20161SEC34	BankingTheoryLawand Practice	2	1	1	3
20161AEC35	BusinessLawforManagers	2	0	2	3
20161AEC36	EssentialofBusinessCommunication	2	0	1	3
RESEARCH SKILLBASEDCOURSE					
20161RMC37	ResearchMethodology	2	0	0	2
	Total	18	2	6	19
AUDITCOURSE					

201LSCOA	OfficeAutomation	1	1	1	2
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SEMESTER-IV

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 19135AEC41	Tamil-IV/AdvancedEnglish-IV/Hindi-IV/French-IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20161SEC43	PartnershipAccount	3	1	2	4
20161SEC44	AdvertisingandSalesPromotion	3	1	1	
201ENSTU45	EnvironmentalStudies	2	0	1	
20161AEC46	CompanyLawandSecretarialPractice	3	0	1	
20161AEC47	OfficeManagement	3	0	1	
	Total	19	2	6	19
AUDITCOURSE					
201LSCLS	LeadershipandManagement Skills	-	-	-	2
201SSCAQ	GeneralAptitudeandQuantitativeAbility				2

SEMESTER- V

Course Code	CourseTitle	L	T	P	C
THEORY					
20161SEC51	CorporateAccounting	4	1	2	4
20161SEC52	FinancialManagement	3	1	1	4
20161SEC53	FinancialServices	3	1	1	4
20161SEC54	ComputerApplicationinBusiness	3	1	1	4
20161DSC55-	DisciplineSpecificElective-I	3	0	1	2
RESEARCH SKILLBASEDCOURSE					
20161BRC57	ParticipationinBoundedResearch	-	-	-	1
	Total	16	4	6	19
AUDITCOURSE					
201ACLSPSL	ProfessionalSkills	1	-	-	2

CourseCode	CourseTitle	L	T	P	C
THEORY					
20161SEC61	ManagementAccounting	3	1	2	5
20161SEC62	EntrepreneurshipandSmallBusinessManagement	3	1	1	5
20161SEC63	Auditing	3	1	1	4
20161DSC64--	DisciplineSpecificElective-II	3	0	2	2
2010EC(2 Digit CourseName	OpenElective	4	0	0	2
20161PRW66	ProjectWork	1	1	1	4
20161PROEE	ProgramExitExamination	1	1	1	1
	Total	16	3	6	23
AUDITCOURSE					
201SSCIM	InterviewSkillsTrainingandMockTest	1	1	1	2
201LSCCE	CommunityEngagement	1	1	1	1
201TERP9	Tally ERP 9	1	1	1	3
TotalCredits-Programme					115
TotalCredits -AuditCourses					19

DISCIPLINESPECIFICELECTIVE

SEMESTER	COURSECODE	COURSETITLE
V	20161DSC55A 20161DSC55B	Stock Exchange PracticeCooperativeLawandP ractice
VI	20161DSC64A 20161DSC64B	IncomeTaxLawandPracticeC o-OperationTheory

OPENELECTIVE

SEMESTER	COURSE CODE	COURSETITLE
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VI	201TAOEC 201ENOEC 201MAOEC 201PHOEC 20CHOEC 201MBOEC 201CSOEC 20CAOEC	TamilIakkiyaVaralaruJ ournalism DevelopmentofMathematicalSkillsI nstrumentation Food and AdulterationWildLifeC onservationWebTechn ology E-Learning
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B.COMCREDITDISTRIBUTION

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	10	06	-	-	-	01	17
II	10	07	-	-	01	-	18
III	10	07	-	-	02	-	19
IV	09	07	-	-	-	03	19
V	-	16	02	-	01	-	19
VI	-	16	02	02	-	03	23
Total	39	59	04	02	04	07	115

	EMPLOYABILITY
	ENTERPRENURSHIP
	SKILL DEVELOPMENT

CourseCode	CourseTitle	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம்- வல்லம் தஞ்சாவூர்

தமிழ்

முதல் பருவம்

முதலாம் ஆண்டு -(BBA , BA, B.COM, CS ,Bsc)

இக்கால இலக்கியம் - செய்யுள், சிறுகதை , நாடகம், இலக்கிய வரலாறு

அலகு : 1.செய்யுள் :

1. தாயுமானவ சுவாமிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்
 2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்
 3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்
 4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்
 5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள் - தமிழ் இனிமை , தமிழ் உணர்வு
- அலகு : 2. செய்யுள்:
6. நாமக்கல் கவிஞர் - தமிழ் தேன், தமிழ் வளர்ச்சி சபதம் செய்வோம் , 40 அடிகள்
 7. ந.பிச்சமூர்த்தி - வழித்துணை - கவிதை கருடன் , 42 அடிகள்
 - 8.கூதா - தேன்மழை, கல்பை , 22 அடிகள்
 9. கண்ணதாசன் - இலக்கியம் , ஒரு பாணையின் கதை , 54 அடிகள்
 10. அப்துல் ரகுமான் - சொந்த சிறகுகள், குப்பையை கிளறும் சிறகுகள், 80 அடிகள்
- அலகு : 3. சிறுகதை :
11. க.சமுத்திரம் - வேரில் பழுத்த பலா
- அலகு : 4. நாடகம் :
12. கு. வெ. பாலசுப்பிரமணியன் , கௌதம புத்தர் (உரைநடை நாடகம்)
- அலகு : 5. இலக்கிய வரலாறு
13. சிறுகதை , புதினம், நாடகம் உரைநடை , கவிதை , புதுக்கவிதை

CourseCode	CourseTitle	L	T	P	C
20111AEC11	AdvancedEnglish-I	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

CourseObjective:

- Tofamiliarizewiththeglossaryterms,figuresofspeech
- Toenhancevocabulary
- Tolearnhowtoeditand proofread
- Toknowthecomparisonandcontrastandcauseandeffectforms
- Tounderstandtheimpact ofthespeechesoffamouspeople

CourseOutcome:

- Develop vocabulary
- Learntoeditanddoproofreading
- Readandcomprehendliterature

UNIT-I

Glossaryofgrammarterms, Figuresofspeech

UNIT-II

Foreignwordsandphrases, BritishandAmericanVocabulary

UNIT-III

Comparisonandcontrast, Causeandeffect

UNIT-IV

Editing, Proofreading

UNIT-V

Speechesoffamouspeople:

MahatmaGandhi- AbrahamLincoln- SwamiVivekananda- JohnF. Kennedy

Referencebook:

Author	Titleofthe book	Edition/Year	Publisher
Wrenand Martin	EnglishGrammar	2009	S.Chand&CompanyLtd
MeenakshiRaman& SangeethaSharma	Technical Communication	SecondEdition 2011	OxfordUniversityPress
Sudhir KumarSharma	The World's Great Speeches	-	GalaxyPublishers

CourseCode	CourseTitle	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- i ToacquaintwithlearningEnglishthroughliterature

Objective:

- ii ToimproveEnglishdelightfullythroughsimplepoems, essays
- iii Tothrowlight onfiction
- iv Toreadandcomprehendliterature

Outcome:

- v. Readandcomprehendliterature
- vi Appreciate the differenttypesofpoetryandprose

UNIT-I

BecauseI couldnot Stopfor Death -Emily

DickinsonStoppingbyWoodsona SnowyEvening -

RobertFrost**UNIT-II**

Enterprise -NissimEzekiel

Lovepoemforawife -A.KRamanujam

UNIT-III

TheArt ofReading -LinYutang

AnEco-Feminist Vision -ArunaGnanadason

UNIT-IV

The MerchantofDeath -NandaKishoreMishra&JohnKennet

She SpokeforallNature -Youngworld‘TheHindu’

UNIT-V

OliverTwist -CharlesDickens

Textbook:

Author	Titleofthe book	Edition/Year	Publisher
S.Murugesan/Dr.K.Chellappan	TheArtofReading/ Experiencing Poetry	Reprint2004	EmeraldPublishers

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M

COURSECODE	COURSE TITLE	L	T	P	C
20161SEC13	Basic Accounting	4	1	0	4

AIM

To develop conceptual understanding of the fundamentals of basic accounting system in a business.

OBJECTIVES

- I. To process transactions and other events through a bookkeeping mechanism to prepare final accounts.
- II. To impart skills in basic accounting for various kinds of business transactions.
- III. To generate basic data for business information.

UNIT-I

Self Study Unit: Introduction – Accounting Concepts and Conventions Book Keeping and Accounting – Accounting Cycle – Objectives and Advantages of Accounting – Journal – Books of Accounts – Format of Journal – Rules of Journalizing.

UNIT-II

Journalizing – Ledger – Subsidiary Books – Trail balance – Rectification of Errors.

UNIT-III

Bills of Exchange – Selfbalancing – Single Entry System.

UNIT-IV

Final accounts of trading and – Non Trading Concerns.

UNIT-V

Depreciation – Methods Fixed – Diminishing Annuity – Depreciation Fund – Provisions and Reserves – Fire Claims.

Employability**OUTCOME**

- Understanding the fundamental of financial accounting
- Develop the modern market economy
- Prepare the different kinds of financial statement
- Acquire conceptual knowledge of basics of accounting
- Identify and analyze the reasons for the difference between cash book and pass book balances
- Develop the skill of recording financial transactions and preparation of reports in accordance with GAAP

REFERENCE BOOKS

1. R.L.Gupta and V.K.Gupta – Financial Accounting – Sultan Chand & Sons.
2. S.P.Jain and K.L.Narang – Principles of Accounting – Kalyan Publications.
3. Reddy and Murthy – Financial Accounting – Murgham Publications.
4. Dr.Radha – Financial Accounting – Prasana Publications

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC14	Business Environment	3	1	0	3

AIM

To study about the different types of environments which influence a business.

OBJECTIVES

- I. To learn the social responsibility of a business.
- II. To study about the basic aspects of a business.
- III. To highlight the economic and other environments of a business.

UNIT-I

Introduction of Business Environment – Nature and Scope of Business – Characteristics of Business – Objectives of Business – Social Responsibilities of Business – Economic Environment – Social and Cultural Environment.

UNIT-II

Political and Legal Environment – Constitutional Environment in India – Legal Environment – Technological Environment – Socio-Cultural Environment.

UNIT-III

Economic Environment; - Economic Systems – Economics systems – Economic Planning – Economic Policies – Business Cycle – Control of Business – Characteristics of Inflation – Control of inflation

UNIT-IV

Financial Environment and Financial System – What is a Financial System – Importance and Role of Banks in the Economy – Functions of Commercial Banks.

Employability**UNIT-V**

Environment Analysis and Managerial Development – Techniques of Environmental Analysis – SWOT Analysis – Training and Development of Professional Managers – Management by Objectives – Methods – Advantages of Management Training – Limitations of MBO

OUTCOME

- Discuss the supply and demand theory and its impact on insurance
- Outline how an entity operates in the business environment
- Explain the legal framework that regulates the insurance industry
- Understand the relationship between environment and business; Applying the environmental analysis techniques in practice
- Understand Economic, Socio-Cultural and Technological Environment
- Know state policies, Economic legislations and Economic reforms laid by the government

REFERENCE BOOKS

1. Dr.S.Sankaran – Business Environment
2. Dr.C.B.Gupta – Business Environment

COURSECODE	COURSE TITLE	L	T	P	C
20161AEC15	Marketing	3	0	0	3

AIM

To learn the role of marketing in the modern Society.

OBJECTIVES

- I. To understand the concept of marketing in the new millennium.
- II. To study the marketing mix by element wise.
- III. To grasp the techniques of Marketing Research.

UNIT-I

Self Study Unit: Introduction of Marketing – Definition – Classification of Marketing – Importance of Marketing – Evolution of Marketing Concepts – Marketing Functions – Marketing Mix.

UNIT-II

Market segmentation – Bases – Benefits – Product Policy – Product Planning and Development – Product Life Cycle – Product Mix.

UNIT-III

Pricing – Meaning of Pricing – Importance of Pricing – Objectives of pricing – Kinds of Pricing – Procedure for price determination – Factors affecting Pricing Policy.

EMPLOYABILITY

UNIT-IV

Sales Promotion – Meaning – Importance of Sales Promotion – Objectives; Advertising – Definition – Objectives – Functions – Importance of Advertising – Advantages and Disadvantages.

UNIT-V

Distribution Channel: Concept – Types of Channels, Factors affecting, choice of distribution channels – Retailers and Wholesalers – Branding and packaging.

OUTCOME

- Understand fundamental marketing concepts, theories and principles in areas of marketing policy
- Apply the knowledge, concepts, tools necessary to understand challenges

REFERENCE BOOKS

1. Rajan Nair – Marketing Management.
2. Philip Kotler – Principles of Marketing. Varshaney – Marketing Management.
3. Arun Kumar – Marketing.
4. S. Ramesh Kumar – Marketing.
5. P. Saravanel – Marketing.

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COURSECODE	COURSETITLE	L	T	P	C
20161AEC16	BusinessEconomics	3	1	3	3

AIM

To study the fundamental principles of business economics.

OBJECTIVES

- I. To apply economic theory and exact procedure to arrive correct business decisions.
- II. To study the economic behaviour of business in theory and practice.

UNIT-I

Definition–Methods of Economics–Meaning of BusinessEconomics–Objectives of BusinessEconomics–Nature of BusinessEconomics–Economics Laws–Micro–MacroEconomics.

UNIT-II

Demand Analysis–Demand Curves–Elasticity of Demand–Indifference Curves.

UNIT-III

Production Function – Factors of Production – Laws of Return – Cost of Production – Curve - Scale of Production – Economics of Large Scale Production.

UNIT-IV

Cost Concepts- Different cost - Long and short run cost curves – Relationship between costs – Breakeven analysis.

UNIT-V

Market Structure – Firm – Equilibrium Firm and Industry – Optimum Firm – Pricing – Pricing Under Perfect Competition – Monopoly–Duopoly–Oligopoly.

Employability

OUTCOME

- Apply the concept of opportunity cost.
- Understand the concepts of cost, nature of production and its relationship to Business operations.
- Apply Economic theories to business decision
- Use the theoretical concept of demand and supply analysis in practice
- Understand the cost concepts, theories of profit and business cycles
- Use different demand forecasting techniques and apply different pricing techniques in business
- Understand the importance of Fiscal policy

REFERENCE BOOKS:

1. K.P.M.Sundaram&EN. Sundaram–BusinessEconomics.
2. S.Sankaran–BusinessEconomics.
3. PN.Reddy&Appanaiyah-BusinessEconomics.

CourseCode	CourseTitle	L	T	P	C
201ACLSICN	IndianConstitution	-	-	-	2

Aim

CourseObjectives:

- To makethestudentsunderstandaboutthedemocraticruleandparliamentarianadministration
- ToappreciatethesalientfeaturesoftheIndianconstitution
- Toknowthefundamentalrightsandconstitutionalremedies
- Tomakefamiliar
withpowersandpositionsoftheunionexecutive,unionparliamentandthesupremecourt
- Toexercisetheadultfranchiseofvotingand
appreciatetheelectoralsystemofIndiandemocracy.

Courseoutcome:

1. Democratic valuesandcitizenshiptrainingaregained
2. Awarenessonfundamentalrightsareestablished
3. Thefunctionofuniongovernmentandstategovernmentarelearnt
4. Thepowerandfunctionsofthejudiciaryarelearntthoroughly
5. Appreciationofdemocraticparliamentaryruleislearnt

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution-
writtenanddetailedconstitution -socialism–secularism-democracyandpublic.

UnitII: Fundamentalrightsandfundamentaldutiesofthecitizens

Right of equality -right of freedom- right against exploitation -right tofreedom of religion-
culturalandeducationalrights-righttoconstitutionalremedies-fundamentalduties.

UnitIII: Directiveprinciplesofstatepolicy

Socialistic principles-Gandhi an principles-liberal and general principles -differences
betweenfundamentalrights anddirectiveprinciples

UnitIV: Theunionexecutive,unionparliamentandSupremeCourt

Powers and positions of the president -qualification _method of election of president and
vicepresident -prime minister -RajyaSabah -Lok Sabah .the supreme court -high court -functions
andpositionofsupremecourtandhighcourt

UnitV: Statecouncil-electionsystemand parliamentarydemocracyin India

State council of ministers -chief minister -election system in India-main features
electioncommission-featuresofIndiandemocracy.

References:

- 1) Palekar.s.a.Indianconstitutiongovernmentandpolitics,ABDpublications,India
- 2) Aiyer,alladikrishnaswami,Constitutionandfundamentalrights1955.
- 3) Markandan.k.c.directivePrinciples intheIndianconstitution1966.
- 4) Kashyap. Subashc, Ourparliament,Nationalbooktrust, NewDelhi1989

SEMESTER I

UNIVERSAL HUMAN VALUES

CourseCode	CourseTitle	L	T	P	C
201ACLSUHV	UniversalHumanValues	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, with out ignoring other aspects that are needed for learner's personality development.

Course Objectives:

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course Outcomes:

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realize their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love. Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy, sympathy for others as prerequisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with 1889 cases of service from history, literature

Unit VII

- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
 - Sharing learners' individual and/or group experience(s) regarding service
 - Simulated situations
 - Case studies
-
- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and ways of overcoming greed. Renunciation with action as true renunciation
 - Individuals who are remembered in history for practicing this value.
 - Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
 - Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
 - Sharing learners' individual and/or group experience(s)
 - Simulated situations
 - Case study

SEMESTERII

CourseCode	CourseTitle	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம் வல்லம் தஞ்சாவூர்
பாட குறியீடு :

தமிழ்

இரண்டாம் பருவம்

முதலாம் ஆண்டு - (BA , Bsc ,B.COM , BBA)

செய்யுள் , சக்தி இலக்கியம் , சிற்றிலக்கியம் , இலக்கிய வரலாறு

அலகு : 1 . செய்யுள்:

1. திருஞானசம்பந்தர் தேவாரம் - கோளறு பதிகம்
2. திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை
3. சுந்தரர் தேவாரம் - திருநொடித் தான் மலை
4. மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2 . செய்யுள்:

5. குலசேகராழ்வார் - பெருமாள் திருமொழி
6. நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்
7. ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
8. திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3 . செய்யுள்:

9. தினமலர் - மூன்றாம் திருமுறை
10. குமரகுருபரர் - மீனாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்
11. திரிசூடராசப்ப கவிராயர் - குற்றால குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்
12. வீரமாமுனிவர் - திருக்காவ லூர்க் கலம்பகம்

அலகு : 4 . புதினம்

13. கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5 . இலக்கிய வரலாறு

14. சைவ வைணவ இலக்கியங்கள் , சிற்றிலக்கியங்கள் , (பள்ளு - பிள்ளைத்தமிழ் , - பரணி)

CourseCode	CourseTitle	L	T	P	C
20111AEC21	AdvancedEnglish-II	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- Tounderstandtheformatofe-mail,faxandmemos
- Towriteitinerary,checklist,invitation,circular,instruction,recommendations
- Tounderstandtheimpactofthebiographiesoffamouspeople

Outcome:

- Developtechnologicalskill
- Abletowriteina varietyofformats
- Readbiographiesanddeveloppersonality

UNIT-I

E-mail, Fax, Memos

UNIT-II

Itinerary, Checklist

UNIT-III

Invitation, Circular

UNIT-IV

Instruction, Recommendations

UNIT-V

Biographiesoffamouspeople:MotherTeresa-MadamCurie-CharlesChaplin-VikramSarabhai

TextBook

Author	Titleofthe book	Edition / Year	Publisher
MeenakshiRaman & SangeethaSharma	TechnicalCom munication	2011	OxfordUniversityPress
Rajendra Pal &J.S.Korlahalli	Business Communication	2015	Sultan

CourseCode	CourseTitle	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- Toacquaintlearnerswithdifferenttrendsofwriting

Objective:

- Toacquirelanguageskillsthroughliterature
- Toenablethestudentstoappreciateliterature
- Todeveloptheconversationalskillsthroughoneactplays

Outcome:

- Appreciatedifferentformsofliterature
- Acquirelanguageskillsthroughliterature
- Broadenthehorizonofknowledge

UNIT-I

Ecology -A.K.Ramanujan

Gift -AliceWalker

TheFirstMeeting -SujataBhatt

UNIT-II

Fueled -MarcieHans

Asleep -Ernst Jandl

Buyingandselling -KhalilGibran

UNIT-III

TheEnd oflivingand TheBeginning ofSurvival -

ChiefSeattleMyWood -E.M.Forster

TheMeetingofRaces -RabindranathTagore

UNIT-IV

TheRefugee -K.A.Abbas

IHave a Dream -MartinLutherking

ThosePeopleNextDoor -A.G.Gardiner

UNIT-V

MarriageisaprivateAffair -ChinuaAchebe

TheFortuneTeller -KarelCapek

Proposal -AntonChekov

Textbook:

Author	Titleofthe book	Edition / Year	Publisher
GowriSivaraman	Gathered Wisdom	Reprint2010	EmeraldPublishers

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC23	BusinessAccounting	4	1	1	4

AIM

To learn the accounting mechanism which is necessary for Business Accounting.

OBJECTIVES

- I. To ascertain the Profit of Branches & Departments.
- II. To learn Hire Purchase and Royalties Accounting.
- III. To practice Partnership Accounting.

Unit-I

Self Study Unit: Branch accounts (excluding foreign branches) - Departmental accounts.

Unit-II

Hire purchase accounts - Installment purchase system

Unit-III

Averaged date - Royalty

EMPLOYABILITY**Unit-IV**

Consignment - Joint venture

Unit-V

Insurance claims for loss of profits - Insolvency accounts - statement of affairs - Insolvency of individual only.

OUTCOME

- Familiarize the concept of Branch account and its system
- Understand the Scope of departmental accounting
- Appreciate the need for negotiable instruments and procedure of accounting for bill honoured and dishonoured
- Differentiate Trade bills from Accommodation Bills
- Understand the concept of Consignment and learn the accounting treatment of the various aspects of consignment
- Distinguish Joint Venture and Partnership and learn the methods of maintaining records under Joint Venture

- Understand the meaning and features of Non-Profit Organizations
- Learn to prepare Receipts & Payment Account, Income & Expenditure Account and Balance Sheet for Non-Profit Organizations

REFERENCE BOOKS

1. Jain and Narang - Advanced Accountancy
2. A. Arulanandam & Rajan - Advanced Accountancy - Himalaya Publishers.
3. Reddy and Murthy - Financial Accounting - Murgham Publications.
4. Dr. Radha - Financial Accounting - Prasana Publications.

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC24	Ethics in Business	3	1	1	3

AIM

To study about the personal values and moral standards and the importance of honesty in business.

OBJECTIVES

- I. To clarify what is ethics and what is not ethics in business.
- II. To apply the ethical principles in day-to-day business practices.
- III. To know the role of various agencies in ensuring the ethics principles and their practices.
- IV. To analyze ethical issues in Indian business.

UNIT-I

Ethics – Meaning and definition – Personal Ethics – Professional Ethics – Business Ethics – Value and Ethics in Business – Corporate Governance Ethics – Benefits to Ethics in Work Place

UNIT-II

Corporate Ethics – Investors Rights – Rights of Share Holders – Privileges, Problems and Protection – Guide for Investors.

UNIT-III

Corporate social Responsibility – Scope of Social Responsibility of Business and Corporate Justification – Advantages – Steps to attain Social Responsibility.

UNIT-IV

The Ethics in Consumer Protection – Consumer and Consumer Protection – Parties to Consumer Protection – Consumer Duties and Responsibilities – Consumer Protection Act 1986 – Consumer Protection Act 2002 – Prevention of Food Adulteration Act 1954.

UNIT-V

Role of various Agencies in Ensuring Ethics in Business – Public Opinion – Auditors – Board of Directors – Media – Advertising – Government Agencies – Judiciary – SEBI

Skill development**OUTCOME**

- Understand, and evaluate various organizational influences affecting ethical decisions
- Present and analyze ethical and moral issues
- Explore ethical theories
- Use contemporary and classical frameworks to analyze and suggest resolutions to ethical dilemmas.
- Identify and address common ethical issues that arise for individuals, managers, and organizations.
- Organize how individual differences and cognitive barriers can influence ethical judgment.

• Identify and prioritize personal values and apply those to making ethical decisions

- REFERENCE BOOKS:
1. A.C. Fernanando – Business Ethics – Pearson Publications.
 2. Biswas – Ethics and Management and Indian Ethics – Vidya Vikas.
 3. Dr. C.B. Gupta – Values and Ethics in Business – Sultan Chand & Sons
 4. Dr. G.K. Kapoor and Dr. G.B. Gupta – Business Law Ethics and Communication – Sultan Chand & Sons.
 5. N.D. Kapoor – Law Ethics and Communication – Sultan Chand & Sons.

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COURSECODE	COURSE TITLE	L	T	P	C
20161AEC25	Business Statistics	3	1	1	3

AIM

To include the Knowledge of statistical tools for executives.

OBJECTIVES

- (i) To provide the much needed information for various business and policy decision.
- (ii) To understand the conceptual and framework and measure of central tendency, dispersion and correlation.

UNIT-I

Classification and Tabulation – graphs and Diagrams – Measures of central tendency – mean, median, Mode, Geometric mean, harmonic mean.

UNIT-II

Measures of dispersion – Range – Quartile deviation – Standard deviation – Co-efficient of variation.

UNIT-III

Correlation – Meaning and definition – Co-efficient of correlation – regression equations.

UNIT-IV

Time series – meaning – Business forecasting – Methods of estimating trend – Graphic, semi average, moving average and least square method.

UNIT-V

Methods of construction of index numbers – Unweighted Aggregate Price Index – Weighted Aggregate Index Numbers – Quantity Index Numbers – Test for Index Numbers – Time Reversal test – Factor reversal Test – Chain base Method – Advantages of Chain base Index Numbers – Cost of living Index Numbers.

Employability**OUTCOME**

- Critically evaluate the underlying assumptions of analysis tools
- Solve a range of problems using the techniques covered
- Conduct basic statistical analysis of data.
- Understand basic statistical concepts such as statistical collection, statistical series, tabular and graphical representation of data

- Calculate measures of central tendency, dispersion and asymmetry, correlation and regression analysis
- Choose a statistical method for solving practical problems

REFERENCE BOOKS

1. P. Navaneetham–Business mathematics
2. S.P.Gupta– statistical methods
3. C.B. Gupta–statistical methods

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COURSECODE	COURSE TITLE	L	T	P	C
20161AEC26	Business Organization and Management	3	0	0	3

AIM

To get an idea of the various business organizations and Management functioning in India.

OBJECTIVES

- I. To study the nature and scope of various business organizations and Management.
- II. To understand the different characteristics of various business organizations and features of Management.

UNIT-I

Business Organization – Forms of Organization – Choice of a Suitable form sole Trader – Partnership – Joint Hindu Family – Joint Stock Company.

UNIT-II

Location of Business Organization – Plant Layout – Problems relating to the establishment of New Business – Facilities for Promotion of Industrial Enterprises in India.

UNIT-III

Industrial Policy in India – Industrial Licensing Policy – New Economic Policy – Globalization.
Employability

UNIT-IV

Business Management – Management & Administration – Contribution by Taylor and Henry & Peter Drucker – Planning Process – Kinds of Planning – Objectives – Advantages & Limitations – Management by Objectives.

UNIT-V

Organizing process – Features – Structure – Different Forms – Departmentation, Delegation and Decentralization – Staffing – Manpower Planning – Directing and Co-Ordination: Principles – Elements – Controlling – Steps.

OUTCOME

- Understand the dynamics of marketing in business
- Ability and confidence to tackle common practical financial problems of business.
- Understand the scope of Business, and its importance.
- Identify different forms of business organizations viz; Sole Proprietorship, Partnership, Joint Hindu Family Business & Co-operative Organizations.

- Understand a Joint Stock Company and various formalities to promote a Company
- Learn various sources of Industrial Financial resources and the means to raise them

REFERENCE BOOKS:

1. Dinker Pagare – Business Organization Management
2. C.B. Gupta – Business Organization and Management.
3. Dr. G.L. Tayal – Modern Business Organization.
4. Y.K. Bhushan – Sultan Chand & Sons Fundamentals of Business Organization and Management.

SEMESTER II
COMMUNICATIONSKILLS

CourseCode	CourseTitle	L	T	P	C
201ACLSCOS	CommunicationSkills	-	-	-	2

Aim:

CourseObjectives:

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

CourseOutcome:

By the end of this program, participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barrier to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text

- ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing-
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in the workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. Powerpoint

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Marketing

Unit VII

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language

- EyeContactandFacialExpression
- HandGestures
- Do'sandDon'ts
- Learningfromexperts
- Activities-BasedLearning

Reference:

1. SenMadhucchanda(2010),*AnIntroduction toCritical Thinking*,Pearson,Delhi
2. SilviaP.J.(2007),*HowtoReadaLot*,AmericanPsychologicalAssociation,Washi
ngtonDC

CourseCode	CourseTitle	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

- பிரிஸ் நிகர்நிலைப் பல்கலைக்கழகம் வல்லம், தஞ்சாவூர்
பாட குறியீடு : 20110AET31

தமிழ்

மூன்றாம் பருவம்

முதலாம் ஆண்டு (BA , Bsc , B.COM, BBA)

செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு

செய்யுள்

அலகு : 1

- 1 . சிலப்பதிகாரம் - மனையறம் படுத்த காதை
- 2 . மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
- 3 . சுவக சிந்தாமணி - விமலைபர் இலம்பகம்

அலகு : 2

- 4 . பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
- 5 . சுப்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்

அலகு : 3

- 6 . சூறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
- 7 . தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு : 4

- 8 . நளவெண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

- 9 . காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

CourseCode	CourseTitle	L	T	P	C
20111AEC31	AdvancedEnglish-III	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

CourseObjective:

- To familiarize with the organs of speech and the description and classification of speechsounds
- Tounderstandconsonant cluster,syllable,wordaccent andintonation.
- Toknowhowtointerpretgraphics
- Towriteslogansandadvertisements

CourseOutcome:

- Understandphonetics
- Developwritingskill
- Abletodevelop creativewriting

UNIT-I

Theorgansofspeech,Classificationofspeechsounds,VowelsandDiphthongs

UNIT-II

Consonants,Consonantcluster

UNIT-III

Syllable, Wordaccent,Intonation

UNIT-IV

Idiom, Interpretationofgraphics

UNIT-V

Sloganwriting,Writingadvertisement

REFERENCEBOOKS:

Author	Titleofthe book	Edition/Year	Publisher
T.B.Balasubramaniyan	AtextbookofPhoneticsfor IndianStudents	Reprint2008	Macmillian
Meenakshi Sharma & SangeethaSharma	TechnicalCommunication	2011	OxfordUniversityPress

CourseCode	CourseTitle	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Course Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Course Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT-I

The Doctor's World -R.K.Narayan

The Postmaster -Rabindranath Tagore

Princess September -E.Somerest Maugham

UNIT-II

The Price of Flowers -Prabhat Kumar Mukhopadhyay

The Open Window -Saki

The Model Millionaire -Oscar Wilde

UNIT-III

My Brother My Brother -Norah Burke

Uneasy Home Coming - Will F. Jenkins

Resignation -Premchand

UNIT-IV

The Referee -

W.H.Andrews & Geoffrey Dreamer The Case of the Stolen Diamonds -

Farrell Mitchell

UNIT-V

The Dear Departed -

Stanley Houghton The Princess and the Wood Cutter-

Alan Alexander Milne **Textbook:**

Author	Title of the book	Edition/Year	Publisher
Steuart H. King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One-Act Play		Emerald

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COURSECODE	COURSETITLE	L	T	P	C
20161SEC33	CostAccounting	2	1	2	4

AIM

To ascertain the cost of products manufactured or services rendered and exercising control over the expenditure.

OBJECTIVES

- I. To know the cost of each process and each element.
- II. To serve management in the execution of policies according to the situations.

UNIT-I

Cost accounting definitions – Functions, Importance, Advantages and Limitations – Relationship between cost and Financial Accounting – Installation of costing system – Cost Unit and Cost Centre – Elements of Cost – Cost sheet – Tender and quotation.

UNIT-II

Materials cost control – Material Purchases – Storage of Material – Various levels of Stock – Pricing of Materials Issues.

UNIT-III

Labour Cost Control – Piece and Time Rates – Incentive Plans – Labour turnover – Idle time – Overheads – Allocation – Apportionment – ReApportionment and Absorption.

UNIT-IV

Process Costing (Excluding Inter Process, Equivalent Production – By product – Joint product) and – Operating Costing.

UNIT-V

Contract Costing – Reconciliation of Cost and Financial Accounting.

Employability**OUTCOME:**

- Understand various costing systems and management systems
- Analyze and provide recommendations to improve the operations of organizations
- Imbibe conceptual knowledge of cost accounting.
- Understand the significance of cost accounting in the modern economic environment
- Select the costs according to their impact on business
- Apply cost accounting methods to evaluate and project business performance

REFERENCE BOOKS

1. Palekhar & Pattan Shetty – Costing.
2. Jain & Narang – Cost Accounting.
3. S.P. Iyengar – Cost Accounting.
4. Ahuja & Others – Cost Accounting.
5. R. Srinivasan & R. Ramachandran – Cost Accounting.

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC34	Banking Theory Law and Practice	2	1	1	3

AIM

To provide a comprehensive view of Banking Services to know the application of Banking Theory Law and Practice.

OBJECTIVES

- I. To highlight the functions and services of a modern bank.
- II. To understand the relationship between banker and customer.
- III. To learn law relating to Negotiable Instruments, Securities and Advances.

UNIT-I

Bank and Banking – Role and importance of Banking – Classification of Commercial Banks – Functions of commercial Banks – Investment Policy of a Commercial Bank – Functions of RBI.

UNIT-II

E – Banking – Forms of E- Banking Automatic Teller Machine (ATMS) – Credit Cards, Debit Cards – Types of Credit Cards – Types of Bank Accounts – Types of Deposits – Electronic Funds Transfer.

UNIT-III

Special Types of Bank customers – The Paying Banker – The Collecting Banker.

UNIT-IV

Negotiable Instruments – Characteristics – Parties to Negotiable Instruments – Endorsement – Types of Endorsement.

UNIT-V

Bills of exchange and Promissory notes – Cheques and Bank Drafts Crossing of Cheques.

Employability

OUTCOME:

Understanding of Banking Channels and Payments

- Practices on Banking Technology
- Understanding of Core Banking
- To gather knowledge on banking and financial system in India
- Understand better customer relationship
- To create awareness about modern banking services like e-banking, m-banking and internet banking

REFERENCE BOOKS

1. B.S.Raman- Banking, Theory, Law and Practice
2. S.M.Sundaram- Banking Theory Law and Practice

3. Varshney and Sundaram - A Text Book on Banking Theory Law Practice
4. K.P.M. Sundaram - Banking Theory Law and Practice

SEMESTER-III

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COURSE CODE	COURSE TITLE	L	T	P	C
20161AEC35	Business Law for Managers	2	0	2	3

AIM:

To know the various principles of commercial laws.

OBJECTIVES:

- I. To study the nature and scope of the Indian Contract Act.
- II. To learn other business related laws and rules.

UNIT-I

Nature and Sources of law – Law of contracts – Essentials of valid contract – Classification of contracts

UNIT-II

Offer and acceptance – consideration – capacity to contract – Free consent – Legality of object

UNIT-III

Performance of contracts – Discharge of contract – Remedies for breach of contract – Quasi contracts

UNIT-IV

Contracts of agency – Different classes of agents – creation of agency – Rights and duties of an agent – scope of agent's authority – Liability of principals to third parties – Personal liability of agent – Bailment and pledge.

UNIT-V

Contract of Indemnity and guarantee – Rights of Indemnity holder – Rights of surety – Nature and extent of surety's liabilities

Employability

OUTCOME:

- Explain the concepts in business laws with respect to foreign trade
- Apply the global business law to current business environment
- Demonstrate an understanding of the Legal Environment of Business.
- Communicate effectively using standard business and legal terminology.
- Demonstrate recognition of the requirements of the contract agreement
- Identify contract remedies
- understand the various provisions of Company Law

REFERENCE BOOKS

1. N.D. Kapoor – Elements of commercial law.

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COURSECODE	COURSE TITLE	L	T	P	C
20161AEC36	Essentials of Business Communication	2	0	1	3

AIM To master the art of communication in the business matter effectively.

OBJECTIVES

- I. To learn and write various types of business letters.
- II. To identify the critical communication points.
- III. To keep the business communication as evidences for future references.

UNIT-I-Introduction to Business Communication

Introduction, Definitions, Basic forms of communication -Communication process- Effective communication - Development of positive personal attitudes - Types of Communication - Media -Barriersto Communication-Principles of Effective Communication.

UNIT-II- Writing Skills drafting of business letters

Correspondence - Norms for Business Letters - Letter for different kinds of situations - Personalized stand letters, enquiries, customers' complaints, collection letters- Sales promotion letters, Application letters- officememorandum - Memo formats - Applications for Job- Enquiry letter- Request letter -Report writing-

Unit III Communication Skills

Non-verbal communication - Personal Appearance Posture - Body Language - Use of Charts, Diagrams & Tables - Visual & Audio Visual Aids for communication - Dyadic communication :Face to Face Communication - Telephonic Conversation. Listening: Meaning, Importance, Types of listening, Tips for effective listening, Barriers for listening

Unit IV Report Writing

Report Writing - Structure of Reports - Long & Short Reports - Formal & Informal Reports - Writing Research Reports, Technical Reports - Norms for including Exhibits & Appendices.

Unit V

Conducting Meetings : Procedure - Preparing agenda, Minutes and Resolutions
Conducting Seminars & Conferences : Procedure of Regulating Speech Evaluating Oral Presentation -
Group Discussion: Drafting Speech - Negotiation Skills.

OUTCOME:

- Identify ethical, legal, cultural, and global issues affecting business communication.
- Utilize analytical and problem-solving skills appropriate to business communication.
- Effective business writing
- Research approaches and information collection.
- Developing and delivering effective presentations
- Effective interpersonal communications
- Skills that maximize team effectiveness.
- Good time management.

REFERENCE BOOKS

1. Rajendrapal and Korlahalli- Business Communication
2. M.S. Ramesh and Pattenshetty- Effective Business English & Correspondence
3. Sharma and Krishnamohan- Report writing Business Correspondence
4. Business communication- PCBhatia- Anebooks Pvt Ltd., -www.anebooks.com.
5. Business communication, principles and methods and Techniques- Nirmal Singh, Deep and Deep publications Pvt Ltd., -www.ddpbooks.com
6. Business communication- Sathyaswaroop Debaish Bhagabandas- PHI learning private ltd.,
7. Business communication-
Meenakshi Raman, Prakash Singh, Oxford university press 5. Foundations of Business communication, India Edition- Dona. J. Young Tata mcgraw-Hill.

SEMESTER-III**PRISTUNIVERSITY, THANJAVUR**

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COURSECODE	COURSE TITLE	L	T	P	C
20161RMC37	Research Methodology	2	0	0	2

AIM

To create a basic appreciation towards research process and awareness of various research publications.

OBJECTIVES

- I. To understand the steps in research process and the suitable methods.
- II. To identify various research communications and their salient features.
- III. To carry out basic literature survey using the common data-bases.

PREREQUISITES:

Basic computer skills for working in window-environment & Conceptual knowledge on basic matrices.

UNIT-I

Research in Management : An Introduction – Definition, meaning and nature – Scope and objects of Research. Types of Research.

UNIT-II

Research Design – Defining Research Problem and Formulation of Hypothesis – Experimental Designs – Sampling and types of sampling.

UNIT-III

Research Process – Steps in the process of Research, Data Collection and Measurement: Sources of Secondary data – Methods of Primary data collection – Questionnaire Construction.
Skill development

UNIT-IV

Data presentation and Analysis – Data Processing – Methods of Statistical analysis and interpretation of Data – Testing of Hypothesis and theory of inference – Correlation and Regression analysis.

UNIT-V

Report writing and Presentation – Steps in Report writing – Types of reports – Formats of Reports – Presentation of a Report.

OUTCOME:

- Able to carry out independent literature survey corresponding to the specific publication type and assess basic literary research tools.
- Familiarize participants with basic of research and the research process.

- Enable the participants in conducting research work and formulating research synopsis and report.
- Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.
- Have basic knowledge on qualitative research techniques
- Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis
- Have basic awareness of data analysis and hypothesis testing procedures

REFERENCE BOOKS

1. Rajendrapal and Korlahalli- Business Communication
2. M.S. Ramesh and Pattenshetty- Effective Business English & Correspondence
3. Sharma and Krishnamohan- Report writing Business Correspondence

SEMESTER III
COMMUNICATIONSKILLS

CourseCode	CourseTitle	L	T	P	C
201ACLSOAN	OFFICEAUTOMATION	-	-	-	2

Aim:

CourseObjectives:

To provide an in-depth training in the use of office automation, internet and internet tools. The course also helpsthecandidates togetacquaintedwithIT.

CourseOutcomes:

Aftercompletionofthecourse,studentswouldbeabletodocuments,spreadsheets,makesmallpresentationsandwouldbeacquaintedwiththeinternet.

UNIT I

Knowing thebasicsofComputers

UNIT II

WordProcessing(MSword)

UNIT III

SpreadSheet(MSXL)

Skill development

UNIT IV

Presentation(MSPowerPoint)

UNIT V

CommunicatingwithInternet

Reference:

1. Fundamentalsofcomputers-V.Rajaraman-Prentice-HallofIndia
2. MicrosoftOffice2007Bible-
JohnWalkenbach,HerbTyson,FaitheWempen,caryN.Prague,MichaelRgroh,PeterG.Aitken,andLisaa.B
ucki -WileyIndia pvt.ltd.
3. IntroductiontoInformationTechnology-AlexisLeon,MathewsLeon,andLeenaLeon,VijayNicole
Imprints Pvt.Ltd.,2013.
4. ComputerFundamentals-P.K.SinhaPublisher:BPBPublications
5. <https://en.wikipedia.org>

6. <https://wiki.openoffice.org/wiki/Documentation>

7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

SEMESTER-IV

CourseCode	CourseTitle	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

• (தமிழ்) இலக்கிய இலக்கியப் படிப்பை முடித்துக் கொடுக்கும் வகையில் தகுந்தாறும்
பாட. குறியீடு : 20110AET41

தமிழ்

நான்காம் பருவம்

முதலாம் ஆண்டு (BA, BSC, B.COM, BBA)

செய்தல், சங்க இலக்கியம், அறு இலக்கியம், செம்மொழி, இலக்கிய வரலாறு

அலகு - 1 : பண்டைய இலக்கியம் - நற்றிணை;

1. நெய்தல் - தோழி கூற்று - பாடல் எண் . 11
2. குறிஞ்சி - தலைவி கூற்று - பாடல் எண் . 64
3. முல்லை - தலைவன் கூற்று - பாடல் எண் . 142
4. பாலை - நந்தாய் கூற்று - பாடல் எண் . 29
5. மருதம் - தலைவி கூற்று - பாடல் எண் . 70

குறந்தொகை

1. குறிஞ்சி - தோழி கூற்று - பாடல் எண் . 1
2. முல்லை - செவ்விர்த்தாய் கூற்று - பாடல் எண் . 167
3. மருதம் - தலைவி கூற்று - பாடல் எண் . 181
4. நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290
5. பாலை - தலைவன் கூற்று - பாடல் எண் . 347

ஐங்குறுநூறு

1. மருதம் - கள்வன் பத்து - முதல் இரண்டு பாடல்கள்
2. நெய்தல் - தோழிக்கு உரைத்த பத்து - முதல் இரண்டு பாடல்கள்
3. குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்
4. பாலை - இளவேனிற் பத்து - முதல் இரண்டு பாடல்கள்
5. முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு - 2 : கவிந்தொகை

1. பாலை - பாடல் எண் . 2
2. குறிஞ்சி - பாடல் எண் . 37

அகநானூறு

1. பாலை - பாடல் எண் . 5
2. மருதம் - பாடல் எண் . 6

புறநானூறு

பாடல் எண் : 6, 121, 41, 153, 172, 191, 223, 246, 284, 358.

பதிற்றுப்பத்து

இரண்டாம் பத்து பாடல் எண் . 4 (நிலம் நூர் வளி விசம்பு)

அலகு - 3 ;

1. பட்டினப்பாலை - முதல் 105 வரிகள்
2. திருக்குறள் - 1.மருந்து 2.உக்கமுடைமை 3.அழவு

அலகு - 4 : செம்மொழி வரலாறு ;

(மொழி - விளக்கம் , மொழிக்குடும்பங்கள் , உலகச் செம்மொழிகள் , இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள் , வாழும் தமிழ் செம்மொழி , தொன்மை , தமிழின் சிறப்புகள் , தமிழ் செம்மொழி நூல்கள்)

அலகு - 5 : இலக்கிய வரலாறு

சங்க இலக்கியங்கள் , பதினெண்குறிய்க்கணக்கு நூல்கள் .

CourseCode	CourseTitle	L	T	P	C
20111AEC41	AdvancedEnglish-IV	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- To familiarizewiththeobjectivesandtypesofinterview
- To knowthetypesofquestionsandansweringtechniques
- Topreparereviewsand proposals
- Tolearnthegrammaticalforms
- To understandthe meaning of a poemandwritethe content
- Towriteforandagainstatopic
- Todrawaflowchart
- Towritedefinitions

Outcome:

- Developwritingskill
- Comprehendanddescribepoems
- Learninterviewingskills

UNIT-I

Interviews

Objectives,types,tensuccessfactors,tailurefactors-Planningandpreparation-Presentation-Type ofquestions-Answeringtechniques.

UNIT-II

Flowchart,Proposals

UNIT-III

Discoursemarkers,Review

UNITIV

Grammaticalforms,Paraphrasing

UNIT-V

Definition,Writing forandagainst atopic.

REFERENCEBOOKS:

Author	Titleofthe book	Edition/Year	Publisher
Rajendra Pal& J.SKorlahalli	Essentials of Business Communication	2015	SultanChand &Sons
Meenakshi Raman & SangeethaSharma	TechnicalCommunication	2011	Oxford University Press
Wren&Martin	English Grammar & Composition	2009	S.Chand

CourseCode	CourseTitle	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Course Objective:

- To explore learner to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Course Outcome:

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express one's views in writing

UNIT-I

My Last Duchess - Robert Browning

The Toys - Coventry Patmore

I, too - Langston Hughes

UNIT-II

How to be a Doctor - Stephen Leacock

My Visions for India -

A.P.J. Abdul Kalam Woman, not the weaker sex -

M.K. Gandhi

UNIT-III

The Best Investment I ever made -

A.J. Cronin The Verger - W.S. Maugham

A Willing Slave - R.K. Narayan

UNIT-IV

Macbeth, As You Like It

UNIT-V

Henry IV, Tempest

Textbook:

Author	Title of the book	Edition/Year	Publisher
Devaraj	English for Enrichment	2012	Emerald Publishers

PRISTUNIVERSITY, THANJAVUR

B.COM COURSE CODE	COURSE TITLE	L	T	P	C
20161SEC43	Partnership Accounts	3	1	2	4

AIM:

The purpose of **accounting** is to accumulate and report on financial information about the performance, financial position, and cash flows of a business. This information is then used to reach decisions about how to manage the business, or invest in it, or lend money to it.

OBJECTIVES:

- I. To understand the general characteristics of a partnership and the importance of each one.
- II. To calculate the division of profits, prepare the proper journal entries, and prepare the financial statements for a partnership.
- III. To calculate and prepare the journal entries for the sale of a partnership interest, the withdrawal of a partner, and the addition of a partner.

IV.**Unit-I**

Partnership - Meaning, Partnership Deed, Capital Accounts. Accounting Treatment - Distribution of Profits - Interest on Partner's Loans - Interest on Capital and Drawings - Salary and Commission of Partner - P&L Appropriation Account - Capital Accounts of partners - Fixed - Fluctuating - Past Adjustment and guarantee.

Unit-II

Admission of Partner, Calculation of Profit sharing ratio - Revaluation of assets and Liabilities - Treatment of Goodwill - Adjustments in Partners' capital Accounts - Revaluation of Assets and Liabilities - Accumulated Profits and Losses, - Partner's Capital Accounts and Balance Sheet.

Unit -III

Retirement of a Partner - calculation of gaining ratio - Treatment of goodwill - Revaluation of assets and liabilities - Accumulated reserves and profits - Adjustments regarding partner's Capital Account - Calculation of profit up to the date of death of a partner - Preparation of Capital Accounts and Balance Sheet.

Unit-IV

Dissolution of partnership firm - Realisation of asset and making payment of Liabilities - Treatment of unrecorded Assets and Liabilities - Preparation of Realisation Accounts - Partner's Capital Accounts and Bank Accounts - Insolvency of a partner - Garners vs Murray - insolvency of all partners - Piece-meal distribution - Proportionate capital - Maximum possible loss.

Unit-V

Amalgamation of firms - Computation of purchase consideration - Conversion of sale of a partnership firm to a company.

Skill development

OUTCOMES:

- Understand the concept of partnership
- Understand the journal entries for the formation of partnership
- Familiarize the concept of Branch account and its system
- Understand the Scope of departmental accounting

- Introduce the system of Hire Purchasing
- Understand partnership account from admission to dissolution

Text and Reference Books (Latest revised edition only)

1. Financial Accounting by T.S.Reddy and A.Murthy, Margham Publications, Chennai.
2. Modern Accountancy by A.Mukherjee and M.Hanif TMH Publishing company – New Delhi
3. Financial Accounting by Dr.S.N.Maheswari, Vikas Publishing House, New Delhi.
4. Advanced Accounting by Grewal and Shukla, S.Chand Publishers, New Delhi.
5. Introduction to Accounting by P.C.Tulasian, Pearson Editions,
6. Financial Accounting by Jain & Narang. Kalyani Publishers, Chennai.

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COURSECODE	COURSETITLE	L	T	P	C
20161SEC44	AdvertisingandSalesPromotion	3	1	1	3

AIM:

To know the role of advertising and salesmanship in the marketing strategy.

OBJECTIVES:

- I. To understand the decision process in advertising management.
- II. To examine the role of salesperson in the present marketing management.

UNIT-I

Meaning, Objectives of promotion – Kinds of promotion, Approaches to – Promotion – Method of Promotion – Factors affecting promotional mix, Optimum promotional mix.

UNIT-II

Advertising – Meaning, Objective, Kinds and significance – Is advertising wasteful? - Scientific advertising – Characteristics of a good advertisement copy

UNIT-III

Media of advertising - choice of advertising media – Advertising Budget – Measuring the effectiveness of advertising

UNIT-IV

Personal Selling – Meaning and importance, kinds of salesmanship, Sales force management, Characteristics of a successful salesperson, Selection Training and remuneration of salesman

UNIT-V

Management of sales promotion, meaning and functions, consumer sales promotion Retail Stores sales promotion, Sales promotion at salesman's level – Problems in sales promotion

Employability**OUTCOME:**

- Understand the key principles and tools of integrated marketing communication
- Explain the environmental factors which influence consumer and organizational decision
- Identify the elements of the communication process between buyers and sellers in business. make in process
- Identify the marketing mix components in relation to market segmentation
- Outline a marketing plan
- Utilize marketing research techniques to resolve into competitive marketing decisions.

REFERENCE BOOKS

1. Dawar, Rustom S. Modern-Marketing in Indian Context.
2. Marketing Management – Rajan Nair
3. Neelamegam S. – Marketing Management in Indian Economy
4. Pillai and Bagavathi – Modern Marketing
5. Chunawalla – Advertising Theory and Practice

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COURSE CODE	COURSE TITLE	L	T	P	C
20161AEC45	Company Law and Secretarial Practice	3	0	1	3

AIM:

To understand all the important aspects of company management and secretarial practice, right from the incorporation of a company to its winding up.

OBJECTIVES:

- I. To study the laws, practices and procedure related to company secretarial work.
- II. To focus on the role of the company secretary.

UNIT-I

Companies Act – Definition of company – formation – kinds – incorporation – characteristics of company – memorandum of association – alteration – duties of secretary regarding the above.

UNIT-II

Articles of association – contents – alteration – Prospectus – Statement in lieu of prospectus – Shares – Kinds – allotment – minimum subscription – transfer and transmission of shares – Share warrant – Share certificate – Secretarial duties regarding the above.

UNIT-III

Types of secretary – Qualification – appointment – functions – Legal position – Rights – Duties – Liabilities
Skill development

UNIT-IV

Directors – Rights – Duties – Powers – Shares qualification – Liabilities.

UNIT-V

Communication pertaining to meetings – Preparation of notices – Agenda – Proxies – Motions – Resolutions – Minutes – Duties of the chairman of the meeting.

OUTCOME:

- Get a basic understanding of different type of meeting of board of directors.
- Use international trade terms and concepts when communicating.
- Demonstrate comprehensive knowledge and understanding of social and economic policy considerations arising in this area.
- Understanding of those areas of company law identified in the indicative syllabus above and form a critical judgement on areas of controversy within the topics studied;
- Read and study primary and secondary sources of company law, with minimal staff guidance; critically analyse, interpret, evaluate and synthesise information from a variety of sources
- Identify sources for research and further develop a strategy for research using standard and electronic research tools

REFERENCE BOOKS

1. N.D. Kapoor - Company Law & Secretarial Practice 1925

2. ShuklaandGulshan–CompanySecretarialPractice
3. Tandon–CompanySecretaryPractice
4. P.K.Ghosh– CompanySecretarialPractice

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COURSECODE	COURSETITLE	L	T	P	C
20161AEC46	OfficeManagement	3	0	1	2

AIM:

To keep in view for the benefit of students of job oriented courses as well as supervision.

OBJECTIVES:

- I. To throw light on the basic principles and functions of office management.
- II. To highlight the management functions of planning, communication, control and their application to the modern office management.

UNIT-I

Office Management – Office Manager and his job – Office Environment

UNIT-II

Location – Planning and layout of accommodation – Office system routine

UNIT-III

Records management, filing – Form Design – Control Office Stationery & Supplies

UNIT-IV

Office correspondence and mail – Communications system –

Office and Management Cost reduction and cost control

UNIT-V

Mailing services, inward and outward mail

Employability**OUTCOME:**

- To make them understand office management and duties of an office manager
- To give an idea about proper filing and indexing of office documents
- To understand the principles of record management and different types of records in business organization
- To enable them to be aware about safety hazards and steps to improve office safety
- To introduce different measures of office work
- The course helped the student to know the importance of Office Management in the present competitive world.

REFERENCE BOOKS

1. G.P. Tarry - Office Management and Control
2. Lettingwell & Rokinson - Tax Book of Office Management
3. S.P. Arora - Office organization & Management
4. E.P. Strong - Increasing office productivity
5. R.K. Ghosh - Office Management

CourseCode	CourseTitle	L	T	P	C
201ENSTU47	EnvironmentalStudies	0	0	0	2

Aims:

UNIT-I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public awareness- natural Resources: Renewable and Non – Renewable Resources- Forest Resources – WaterResources- MineralResources- FoodResources–EnergyResources–LandResources.

UNIT-II

Ecosystems-Conceptofanecosystem–Structureandfunctionofanecosystem–Producers,consumers and decomposers – Energy flow in the ecosystem – Ecological succession- Food chains, food websandecologicalpyramids–Typesofecosystem–Forestecosystem–Greenlandecosystem–Desertecosystem – Aquaticecosystems.

UNIT-III

BiodiversityanditsConservation–Definition-Genetic,Speciesandecosystemdiversity– BiogeographicalclassificationofIndia– Valuesofbiodiversity–Biodiversityatglobal,Nationalandlocallevels – Indiaasamega–diversitynation–Hot-spotsofbiodiversity–Threatstobiodiversity– EndangeredandendemicspeciesofIndia–Conservationof biodiversity.

UNIT-IV

EnvironmentalPollution–Definition–AirPollution–Waterpollution–SoilPollution-MarinePollution- Noise Pollution –Thermal Pollution – Nuclear hazards –Solid waste Management–Role of anindividualinpreventionofpollution–Disastermanagement.

UNIT-V

Social Issues and the Environment – From Unsustainable to Sustainable development- Urban problemsrelated to energy –Water conservation, rain water harvesting, watershed management- Environmental Ethics –Climatechange,greenhouseeffectandglobalwarming–Ozonedepletion–Wastelandreclamation– Consumerismandwasteproducts–EnvironmentalLegislation– Issuesinvolvedinenforcementofenvironmentallegislation–Publicawareness-Humanpopulationandthe environment.

Employability

OUTCOME:

- Mastercoreconceptsand methodsfromecologicalandphysicalsciencesandtheirapplicationinenvironmentalproblemsolving.
- Mastercoreconceptsand methodsfromeconomic,political,andsocialanalysis astheypertaintothedesignandevaluationofenvironmentalpolicesandinstitutions.
- Appreciatetheethical, cross-cultural, andhistoricalcontextofenvironmentalissuesandthelinksbetweenhumanandnaturalsystems.
- Understandthetransnationalcharacterofenvironmentalproblemsandwaysofaddressingthem,includ inginteractionsacrosslocaltoglobalscales.
- Applysystemsconceptsandmethodologiestoanalyzeandunderstandinteractionsbetweensocialandenviro nmentalprocesses.
- Reflectcriticallyabouttheirrolesandidentitiesascitizens,consumersandenvironmentalactorsinacomplex ,interconnectedworld.
- Demonstrateproficiencyinquantitativemethods,qualitativeanalysis,criticalthinking, andwrittenandoral communication needed to conduct high-level work as interdisciplinary scholars and/orpractitioners.

TEXTBOOK:

SEMESTERIV

CourseCode	CourseTitle	L	T	P	C
201ACLSLMS	LeadershipandManagement Skills	-	-	-	2

Aim:

The aim of the course cultivatingandnurturingtheinnateleadershipskills of the youths so that they may transform these challenges into opportunities and become torchbearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help student to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence, and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach to leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Model of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Teamwork

- Negotiation
- Networking

UNITII-ManagerialSkills

a. BasicManagerialSkills

- Planningforeffectivemanagement
- Howtoorganiseteams?
- Recruitingandretainingtalent
- Delegationoftasks
- Learntocoordinate
- Conflictmanagement

b. SelfManagementSkills

- Understandingselfconcept
- Developingself-awareness
- Self-examination
- Self-regulation

UNITIII-EntrepreneurialSkills

a. BasicsofEntrepreneurship

- Meaningofentrepreneurship
- Classificationandtypesofentrepreneurship
- Traitsandcompetenciesofentrepreneur

b. CreatingBusinessPlan

- Problemidentificationand ideageneration
- Ideavalidation
- Pitchmaking

UNITIV-InnovativeLeadershipandDesignThinking

a. InnovativeLeadership

- Conceptofemotionalandsocialintelligence
- Synthesisofhumanandartificialintelligence
- Whydoesculture matterfortoday'sgloballeaders

b. DesignThinking

- Whatisdesignthinking?
- Keyelementsofdesignthinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- Howtotransformchallengesintoopportunities?
- Howtodevelophuman-centricsolutions forcreatingocialgood?

UNITV-EthicsandIntegrity

a. LearningthroughBiographies

- Whatmakesanindividualgreat?
- Understandingthepersonaofaleaderfor derivingholisticinspiration
- Drawinginsightsforleadership
- Howleaderssailthroughdifficultsituations?

b. EthicsandConduct

- Importanceofethics
- Ethicaldecisionmaking
- Personalandprofessionalmodesofconduct

- Creating a harmonious life

Bibliography and Suggested Readings:

Books

- Ashokan, M.S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M.H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harper Collins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam -
 "A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6):60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC51	Corporate Accounting	3	1	2	4

AIM

The course covers the basic accounting practices of corporate businesses.

OBJECTIVES

- I. To understand the accounting side of shares, debentures and bonus shares.
- II. To ascertain the net profit of the corporate businesses through final accounts.
- III. To compute valuation of goodwill and shares of corporate businesses.
- IV. To carry out the various strategies of the corporate businesses in the form of merger, reorganization and liquidation.

UNIT-I

Issue and forfeiture of shares – Redemption of Preference shares.

UNIT-II

Issue of Debentures – Redemption of debentures – Profits prior to Incorporation.

UNIT-III

Final accounts of corporate businesses – Divisible profit and dividends – Bonus shares.
Employability

UNIT-IV

Valuation of goodwill and shares – Holding Company.

UNIT-V

Alteration of share capital and internal Reconstruction – Amalgamation and External Reconstruction.

OUTCOME:

- Find out how a company can dissolve.
- Understand Mutual funds' investments.
- Learn about working format of companies.
- Enabling the student to understand the features of Shares and Debentures
- Develop an understanding about redemption of Shares and Debenture and its type
- Exposure to the company final accounts

REFERENCE BOOKS

1. M.C. Shukla and T.S. Grewal – Advanced Accounts.
2. R.L. Gupta – Advanced Accountancy Vol. – II.
3. Jain and Narang – Advanced Accountancy Vol. – II.

4. S.P.Iyengar–AdvancedAccountancyVol.–II.
5. Dr.R.RamachandarnandDr.R.Srinivasan–CorporateAccounting

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COURSECODE	COURSETITLE	L	T	P	C
20161SEC52	FinancialManagement	3	1	1	4

AIM

To focus on the analytical approach to financial decisions.

OBJECTIVES

- I. To know the basic financial management concepts.
- II. To study the important development in Indian capital Market and its impact on the corporate financial management.

UNIT-I

Introduction – Finance and related disciplines – Scope of financial management – Objectives of financial management – Financial Decisions – Organization of finance function.

UNIT-II

Cost of capital – Cost of debt – Cost of Preference shares – cost of equity – Cost of retained earnings – Weighted average cost of capital.

UNIT-III

Introduction – Capital structure – Determinants – Theories net income approach – net operating income approach – M.M. Approach – Traditional approach.

Skill development

UNIT- IV

Leverages meaning and Types – Significance – Operating leverage – Financial and combined leverage.

UNIT-V

Dividend policy – factors influencing dividend policy – Theories – Relationship with value of firms – Stock dividend – Stock splits.

OUTCOME

- Use business finance terms and concepts when communicating.
- Demonstrate a basic understanding of financial management.
- Provide introduction to Financial Management
- Create an awareness about capital structure and theories of capital structure
- Make them understand the cost of capital in wide aspects
- Provide knowledge about dividend policies and various dividend models.
- Enable them to understand working capital management

REFERENCE BOOKS

1. Kulkarani – Financial management
2. S.N. Maheswari – Financial management
3. R.K. Sharma – Financial management
4. Prasanna Chandra – Fundamentals of Financial management
5. R. Ramachandran, R. Srinivasan – Financial management

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COURSECODE	COURSETITLE	L	T	P	C
20161SEC53	FinancialServices	3	1	1	4

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

- I. To gain knowledge on financial services.
- II. To understand importance of various services including banking, insurance, mutual funds.

UNIT-I

Structure of Indian Financial System – Financial assets – Financial intermediaries – Financial market – Money market – capital market.

UNIT-II

Merchant banking – Definition – Objectives – Functions – Management of New Issues – Indian experience – SEBI Guidelines.

UNIT-III

Mutual funds: Meaning – Types – Functions – Institutions involved – UTI, LIC, and Commercial banks – Entry of Private sector – Growth of mutual funds in India – SEBI Guidelines.

UNIT-IV

Lease Financing : The concept – Types – Merits and demerits of leasing – Hire purchase – Meaning – Lease Vs Hire purchases – Problems & Prospects of Hire Purchase in India.

Employability

UNIT-V

Factoring : The concept – factoring mechanism – Factoring in India – Forfeiting – Definition – Factoring Vs Forfeiting – Venture capital – Credit rating – Benefits – Rating symbols – Rating agencies in India.

OUTCOME

- Forecast a firm's future financing requirements
- Design an optimal capital structure.
- Give an idea about fundamentals of financial services and players in financial sectors
- Create an awareness about merchant banking, issue management, capital markets and role of SEBI
- Provide knowledge about leasing and hire purchase concepts
- Make them understand about different types of insurance and IRDA Act.

REFERENCE BOOKS

1. Gordon, Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kuccho S.C. – Financial Management
4. Pandey I.M. – Financial Management.

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC54	Computer Application in Business	3	1	1	4

AIM:

To apply the computer techniques for the various business activities.

OBJECTIVES:

- I. To study the fundamental of the computers.
- II. To understand data processing techniques, concepts of programming languages.

UNIT-I

Introduction to Computer – Generation of computer – Characteristic of computer – Area of Applications – Components of Computer.

UNIT-II

Objectives of windows – introduction to logging of desktop and task bar – Creation of file and folder – window explorer – find option – shortcut – brief case running applications – customization.

UNIT-III

Word – Objectives – introduction to word – creating word – document – creating business letters – formatting documents – word count – thesaurus – Mail merge – Excel – Objectives – Introduction to Spreadsheet – creating worksheet – Editing work sheet – charts – applications of financial and statistical functions – Shorting data – filtering data.
Skill development

UNIT-IV

Tally – introduction – objectives – fundamentals of computerized accounting – principal of accounting – Computerized accounting vs. Manual accounting – Tally advances – introduction to inventory.

UNIT- V

Introduction to E- Commerce – scope – issues and impact of E- Commerce classification of E- Commerce applications and benefit of E-Commerce – Advantages & Disadvantages of E-commerce – technology and framework of E-Commerce – E-Payment – EFT-Banking applications.

OUTCOME:

- Study the development of computers and their components in each stage.
- Develop an idea of software, programming language and operating system.
- Study the concept of developing database and its maintenance using computers in business Concern
- Analyze the importance of management information system and networking in a business.
- Be aware and perform various activities using computers in day to day life.

REFERENCE BOOKS

1. Computer Applications in Business – K Mohan Kumar and Dr. S. Rajkumar – The MCGraw Hill Publication.
2. Computer Applications in Business with Tally ERP9 – By S.V.P. Rizwan Ahmed – Margham Publication.
3. Srinivasa Vallabhan – Computer Applications in Business.
4. K. Mohan Kumar and Dr. S. Rajkumar – Computer Application in Business.
5. Deva Publication – Computerized Accounting under Tally.

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COURSECODE	COURSE TITLE	L	T	P	C
20161DSC55A	Elective Paper-I-A-Stock Exchange Practice	3	0	1	2

AIM:

This course aims at giving a comprehensive understanding on the stock market operations in terms of its structure, trading, settlement procedures, processes and related components and the regulations, emerging challenges in the Indian Stock market.

OBJECTIVES

- I. To provide an introduction to the financial markets and to analyze the role of financial markets for the broader macro.
- II. The course will help them in building career in stock market/broking houses.
- III. To help them to understand the practical aspects of primary and secondary market operations.

UNIT-I

Capital Markets in India - An overview of Indian Securities Market, Meaning, Functions, Intermediaries, Role of Primary Market – Methods of floatation of capital – Problems of New Issues Market – Investor protection in primary market – Recent trends in primary market – SEBI measures for primary market

UNIT-II

Stock exchanges and its Functions : Meaning, Nature, Functions of Secondary Market – Organization and Regulatory framework for stock exchanges in India – SEBI: functions and measures for secondary market – Overview of major stock exchanges in India –

UNIT- III

Trading, settlement and Surveillance System In Stock Exchanges : Different trading systems – BSE - BOLTS system – Different types of settlements – Pay-in and Pay-out – Bad Delivery – Short delivery – Auction – NSE – NEAT system options – Market types, Order types and books

UNIT-IV

Meaning, Purpose, and Construction in developing index – Methods (Weighted Aggregate Value method, Weighted Average of Price Relatives method, Free-Float method) – Stock market indices in India – BSE Sensex- Scrip selection criteria

Skill development

UNIT-V

OUTCOMES:

- Understand the trading mechanism in stock exchange.
- Understand the trading pattern in BSE and NSE.
- Get knowledge on the Demat Trading.
- Discuss on the SEBI guidelines and other regulations relating to Demat Trading.
- Get through the certification examinations conducted by BSE and NSE, and
- Start stock trading concern and become a successful Financial Entrepreneur.
- Pedagogical Methods Adopted: Flipped Learning, Blended Learning, Experiential Learning,
- Participative Learning, Case Study Method and Problem Based Learning

Text Book:

1. Punithavathy Pandian, “Security Analysis and Portfolio Management”, Vikas Publishing House Pvt. Ltd.
2. 2. Prasanna Chandra, “Investment Analysis and Portfolio management”, Tata McGraw Hill, 3rd Edn., 2008
3. V. A. Avadhani, Investment and Securities Market in India, Himalaya Publishing House.
4. Sanjeev Agarwal, A Guide to Indian Capital Market, Bharat Publishers.

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COURSECODE	COURSE TITLE	L	T	P	C
20161DSC55B	Elective Paper-II-B-Co-operative Law and Practice	3	0	1	2

AIM:

To make the students gain expert knowledge in co-operative law and Practices.

OBJECTIVES:

- (i) To learn the important concepts in co-operative law.
- (ii) To understand all the important legal aspects of co-operative management

from the incorporation stage to the winding up stage.

Unit-I

Registration – Change of Liability – By – Laws – Amendment of by – Laws – Power of the Registrar to direct Amendment of by – laws – Divisions – Amalgamation – Power of Registrar in Amalgamation – Conversion – Transfer of Assets and Liabilities among Registered Societies.

Unit-II

Qualification and Disqualification for Membership – Duties and rights of Members – Management of registered Societies – Constitution of Representative – General Body – Constitution of Board – Disqualification for Membership of a Board – Election of Office bearers of the Board – Removal of Member of the Board.

Unit-III

Duties and Privileges of Registered Societies, Charges of societies – Deduction from Salary etc Property and Funds of Registered societies – Investment of Funds – Disposal of Net profits.

Unit-IV

Execution of Decrees, Decisions, Awards and Orders – Procedure for Attachment and Sale of Immovable Properties – Appeal, Review and Revision – Offences – Penalties

Unit-V

Audit, Inquiry, Inspection, Surcharge and supervision – Settlement of Disputes – Mode of Service and Summons – Winding up – Powers of Liquidator – Power of Registrar under the Co-operative Societies Act 1983.

Skill development**OUTCOMES:**

- Know about the company law in India.
- Understand the use of the memorandum of association and article of association in a company, they also learn from this course
- Develop Professionals in the field of Co-operation, Co-operative law and Management.
- Promote qualified, Skilled and professional manpower to manage the affairs of the Cooperative Institutions.
- Enhance the Knowledge base of the in-service Personnel on the subject Co-operation, Co-operative law and Co-operative Management.
- Enable the in-service personnel to develop skills on Co-

SEMESTER V
COMMUNICATIONSKILLS

CourseCode	CourseTitle	L	T	P	C
201ACLSPSL	ProfessionalSkills	-	-	-	2

Aim:

CourseObjectives:

TheObjectivesofthecoursearetohelpstudents/candidates:

1. Acquirecareer skillsandfullypursuetopartakeinasuccessfulcareerpath
2. Prepareagoodresume,prepareforinterviewsandgroupdiscussions
3. Exploredesiredcareeropportunitiesintheemploymentmarketinconsiderationofan individualSWOT.

CourseOutcomes:

Attheendofthiscoursethestudentwill beableto:

1. Preparetheirresumeinanappropriatetemplatewithoutgrammaticalandothererrorsand usingpropersyntax
2. Participateinasimulatedinterview
3. Activelyparticipateingroupdiscussionstowardsgainfulemployment
4. Captureaself-interviewsimulationvideoregardingthejobroleconcerned
5. Enlistthecommonerrorsgenerallymadebycandidatesinaninterview
6. Performappropriatelyandeffectivelyingroupdiscussions
7. Exploresources(online/offline) ofcareeropportunities
8. Identifycareeropportunitiesinconsiderationoftheirownpotentialandaspirations
9. Usethenecessarycomponentsrequiredtoprepareforacareerinanidentifiedoccupation (asacasestudy).

UnitI:ResumeSkills

ResumeSkills:PreparationandPresentation

- Introductionofresumeanditsimportance
- Differencebetween aCV,ResumeandBiodata
- Essentialcomponentsofagoodresume

ii. Resumeskills:commonerrors

- Commonerrorspeoplegenerallymakeinpreparingtheirresume
- Prepareagoodresumeofother/hisconsidering allessentialcomponents

UnitII:InterviewSkills

i. InterviewSkills:PreparationandPresentation

- Meaningandtypesofinterview(F2F,telephonic,video,etc.)
- DressCode,BackgroundResearch,Do'sandDon'ts
- Situation,Task,ApproachandResponse(STARApproach)forfacingan interview
- Interviewprocedure(opening,listeningskills,closure,etc.)

- Important questions generally asked in a job interview (open and closed ended questions)

ii. Interview Skills: Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

iii. Interview Skills: Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion-Simulation
- Group Discussion-Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC61	Management Accounting	3	1	2	5

AIM

To emphasize the importance of accounting information for managerial decision making and solving problems.

OBJECTIVES

- i. To gain expert knowledge of the techniques of managerial accounting.
- ii. To know the application of various financial tools for making managerial decisions.
- iii. To apply techniques of costing for business decisions.

UNIT-I

Definition of management accounting – Nature, scope, objectives, Functions of management accounting – Management Accounting and Financial Accounting Management Accounting and Cost Accounting – Advantages & Limitations of Management Accounting.

UNIT-II

Financial Statement Analysis – Comparative statement – Common size statement – Trend percentages – Ratio Analysis.

UNIT-III

Fund Flow Analysis and Cash Flow Analysis.

UNIT-IV

Marginal costing and Break – Even analysis – Budget and budgetary controls – Classification of budgets.

UNIT-V

Standard costing and variance analysis, Capital budgeting – Importance – Techniques of Capital budgeting.

Employability

OUTCOME

- Prepare analysis of various special decisions, using relevant costing and benefits
- More effective planning and control systems
- The student's thought and knowledge on management Accounting
- Help to give proper idea on financial statement analysis in practical point of view
- Introduce the concept of fund flow and cash flow statement
- Provide knowledge about budget control keeping in mind the scope of the concept
- Develop the know-how and concept of marginal costing with practical problems

1. ShashiK.Gupta&R.K.Sharma–ManagementAccounting
2. S.N.Maheswari–ManagementAccounting
3. R.RamachandranandR.Srinivasan–ManagementAccounting
4. HingoraniandRamanathan– ManagementAccounting

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC62	EntrepreneurshipandSmallBusinessManagement	3	1	1	4

AIM:

To know the role of entrepreneurs and small businesses in the economic development of the country.

OBJECTIVES:

- I. To study the environment for entrepreneurship development.
- II. To identify suitable business opportunities for small businesses.
- III. To prepare project report and appraise project implementation.

UNIT-I

Concept of Entrepreneurship – Definitions – Types of Entrepreneurship – Functions – Characteristics – Role of Entrepreneurs in the Economic Development – Factors affecting entrepreneurial growth.

UNIT –II

Entrepreneurial Development Programmes – Self-Employment schemes – Objectives of EDP – Women entrepreneurs – Phases of EDP – Govt. Policies on entrepreneurial development – Small Entrepreneurs development.

UNIT – III

Steps Involved in Establishing a small business – generation of Project ideas – Project identification – Selection of a product – Project formulation – assessment of project feasibility study.

UNIT –IV

Legal formalities; Registration and licensing of small scale industrial unit Benefits – Stages of Registration – Procedures for Registration – Deregistration – Filing of Entrepreneur Memorandum – Licensing for SSI sector.

UNIT-V

Issues in small business marketing – small entrepreneurs in International Business – Accounting for small business – office organization for small business – sickness in small industries.

Employability

OUTCOME:

- Understand the systematic process to select the business ideas.
- Write a business plan
- Develop students about Entrepreneurship development
- Create an awareness on various Entrepreneurship Development Programme
- Enable them to understand project formulation
- Familiarize the students with EDP schemes

REFERENCE BOOKS:

1. P. Saranavel – Entrepreneurial Development.
2. Dr. C.B. Gupta – Entrepreneurship & Small Business Management.
3. Dr. S.S. Khanka – Entrepreneurship & Small Business Management.

4. Dr.Radha-EntrepreneurialDevelopment.
5. Dr.P.T.Vijayshree-Entrepreneurship&SmallBusinessManagement

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COURSECODE	COURSE TITLE	L	T	P	C
20161SEC63	Auditing	3	1	1	4

AIM

To study and report about the state of affairs of business in the Organization.

OBJECTIVES

- I. To trace errors and frauds in business.
- II. To analyze the available evidences of all receipts and payments.
- III. To protect the interest of stakeholder and outsiders.

UNIT-I

Auditing–Definition–Objectives–Types of Audit–Advantages–Qualities of a professional auditor–Investigation Vs Auditing.

UNIT-II

Internal Check–Objectives, Principles, Advantages–Internal Checks system and Auditor–Internal Control–Internal Audit.

UNIT-III

Vouching–Objectives, Importance, -
Vouching of Cash Transactions, Trading Transactions and Impersonal Ledger.
Employability

UNIT-IV

Verification and valuation of assets and Liabilities–Cash–Investments–Advances, Land and Building, Plant and Machinery, Furniture, Stock, Capital, Creditors, Bills payable.

UNIT-V

Company Audit–
Provision in the Companies Act relating to auditor's qualifications, appointment, removal, Rights, duties and liabilities, (Civil and Criminal).

OUTCOME

- Articulate knowledge of fundamental audit concepts
- Apply critical thinking skills and solve auditing Problems.
- Apply and demonstrate the accounting knowledge and skills in Auditing.
- Explain how analytical procedures are used as an audit tool.
- Illustrate effective internal controls

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COURSECODE	COURSE TITLE	L	T	P	C
20161DSC64A	Elective paper-I-A-Income Tax Law and Practice	3	0	2	3

AIM:

To understand the basic elements of Income Tax theory, Law and Practice.

OBJECTIVES:

- I. To learn the basic concepts in Income Tax Law
- II. To identify the various sources of income.
- III. To know tax exemptions and deductions.

UNIT-I

Basic Concepts – Definitions – Assesses – Person, income, assessment year, previous year, basis of charge: Determination of Residential Status – Incomes exempt from tax under Sections 10, 11, 12, 13 and 13A.

UNIT-II

Salary: Definition – Salary under section 17 – allowances, perquisites, profit in lieu of salary – deductions under section 16 – computation of salary income.

UNIT-III

House property: Definition, exempted incomes from house property – Annual value – determination of annual value – Let out – Self occupied – Deductions – computation of property income.

Skill development

UNIT-IV

Profits and Gains of business or profession – definition – charging provisions – deductions – computation of business and professional income

UNIT-V

Capital Gains: Basis of charge – Cost of acquisition, cost of improvement – exempted capital gain – computation of capital gain – Income from other sources – Chargeability – deductions – Computation of Income under other sources.

OUTCOMES:

- File IT Return on individual basis
- Compute the total Income and Define tax complications and structure.
- In order to familiarize the different know-how and heads of income with its components
- It helps to build an idea about income from house property as a concept
- It gives more idea about the income from business or profession

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COURSECODE	COURSE TITLE	L	T	P	C
20161DSC64B	Elective paper – II-B-Co-operation Theory	3	0	2	3

AIM:

To understand the basic principles of co-operation and their application to the various co-operative organization.

OBJECTIVES:

- I. To study the functioning of various co-operative organizations.
- II. To analyze the impact of co-operative credit on agriculture.

UNIT-I

Principles of Co-operation – Meaning – Rochdale Principles – Reformulation of Co-operative Principles – Committee on Co-operative Principles 1937 and 1966 – Application of Co-operative Principles in Practice – Evolution of Co-operative Principles

UNIT-II

Co-operation and other forms of economic organization: Co-operation and Capitalism – Communism and Socialism – Co-operation as a balancing sector – Co-operative as a system, a sector & a movement – Characteristics of Co-operative economy – Benefits of Co-operation, Economic, Social, Educational and Political.

UNIT-III

History of Co-operative Movement in India – Co-operative Credit Societies Act 1904–1912 – Multi Unit Co-operative Societies Act 1957 – Recent trends in Co-operative act – Producer companies
Employability

UNIT-IV

Co-operative credit movement in India – Primary Agricultural co-operative bank central co-operative Banks – State co-operative Banks – co-operative Agricultural and Rural development Bank – State Co-operative Agricultural and Rural Development Bank

UNIT-V

Co-operative Marketing – Service Co-operatives – Non Credit Societies – Co-operative Urban Banks – Employees Credit Society – Consumer Co-operatives – Housing Co-operatives – Dairy Co-operatives

OUTCOMES:

- More on-task behavior Greater Social support
- Develop Professionals in the field of Co-operation, Co-operative law and Management.
- Promote qualified, Skilled and professional manpower to manage the affairs of the Cooperative Institutions.
- Enhance the Knowledge base of the in-service Personnel on the subject Co-operation, Co-operative law and Co-operative Management.
- Enable the in-service personnel to develop skills on Co-operative Management Techniques

REFERENCE BOOKS

1. B.S.Mathur-Co-operation Theory
2. Hajeela-Principles of Co-operation
3. Rangasamy-Co-operation

SEMESTERVI

CourseCode	CourseTitle	L	T	P	C
201ACLSCET	CommunityEngagement	-	-	-	1

Aim:

CourseObjectives:

- Todevelopanappreciationofruralculture,life-styleandwisdomamongststudents
- Tolearnaboutthestatusofvariousagriculturalandruraldevelopmentprogrammes
- Tounderstandcausesforruraldistressandpovertyandexploresolutionsforthe same
- Toapplyclassroomknowledgeofcoursestofieldrealitiesandtherebyimprovequalityoflearning

CourseOutcomes:

Aftercompletingthiscourse,studentswillbeableto

- Gainanunderstandingofrurallife,cultureandsocialrealities
- Developasenseofempathyandthebondsofmaturitywiththelocalcommunity
- AppreciatesignificantcontributionsoflocalcommunitiestoIndiansocietyandeconomy
- Learntovaluethelocalknowledgeandwisdomofthecommunity
- Identify opportunities for contributing to community's socio-economicimprovements

UNITI-AppreciationofRuralSociety

Rurallifestyle,rural

society,casteandgenderrelations,ruralvalueswithrespecttocommunity,natureandresources,elaboration of“soulofIndiaiesinvillages”(Gandhi),ruralinfrastructure.

UNITII-Understandingruraleconomy&livelihood

Agriculture,farming,landownership,watermanagement,animalhusbandry,non-farmlivelihoodsandartisans,ruralentrepreneurs,ruralmarkets

UNITIIIRuralInstitutions

Traditional rural organisations,Self-help Groups,Panchayati Raj institutions(Gram Sabha, GramPanchayat, StandingCommittees),localcivilsociety,localadministration

UNITIVRuralDevelopmentProgrammes

History of rural development in India, current national programmes: Sarva Shiksha

Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awas Yojana,

Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

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M
Open Elective- Journalism

COURSE CODE	COURSE TITLE	L	T	P	C
201ENOEC	Open Elective - Journalism	4	0	0	2

Aim:

- To acquaint with the basic knowledge of journalism

Objective:

- To instil in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub-editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist
- Explore the different kinds of news

UNIT-I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT-II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT-IV

The Editor and the Sub-editor

UNIT-V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

Reference Book:-

Author	Title of the book	Edition/Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M. James Neal	News Writing and Reporting		Surjeet Publication
M. V Komath	The Journalist's Handbook		

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M

Open Elective: Development of Mathematical Skills

COURSECODE	COURSE TITLE	L	T	P	C
201MAOEC	Open Elective : Development Of Mathematical Skills	4	0	0	2

Objectives

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make decisions and solve problems.

To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III Set theory –

Series **Unit IV**

Matrices – Determinants

Unit V

Assignment problems

References

1. P.A.Navanitham, Business Mathematics & Statistics
2. Kantiswarup, P.K.Gupta and Manmohan, "Operations Research"
 - Learning outcomes
 - By the end of this course, you should be able to
 - know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, statistics, Matrices and Business mathematics)
 - use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts

- Select and apply general rules correctly to solve problems including those in real-life contexts.

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M

Open Elective: Instrumentation

COURSE CODE	COURSE TITLE	L	T	P	C
201PHOEC	Open Elective: Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for student to work as part of team on multi-disciplinary projects.

UNIT-I: INTRODUCTION

Potentiometer-

calibration of voltmeter and ammeter, measurement of resistance, Principles of network theorems-

Thevenin's and Norton's theorem - Bridges:

AC bridges - Maxwell, Owen, Schering and de Sauty's bridges - Wien bridges.

UNIT-II: ELECTRONIC INSTRUMENTS-I

Basic characteristics of instruments - resolution - sensitivity -

Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter - resistance meter -

Amplified D.C. meter -

Chopper stabilized amplifier - A.C. Voltmeter using

rectifiers - Electronic multimeter - Differential voltmeter - Digital voltmeters -

Component measuring instruments (quantitative studies)

UNIT-III: ELECTRONIC INSTRUMENTS-II

Signal conditioning systems - DC and AC carrier systems - Instrumentation amplifiers -

Vibrating capacitor amplifier - Analog to digital data and sampling - A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV - Recording Devices

Recorders necessity - Recording requirements - Analog recorders - Graphic recorders - strip chart recorders -

Galvanometer types recorders - Null type recorders.

Unit V - CRO

CRO - Construction and action - Beam transit time and frequency limitations -

Measurement of potential, current, resistance, phase and frequency - Special purpose oscilloscopes -

Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhney – Dhanpat Rai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver C. Sage – McGraw Hill – 1975.

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M

COURSECODE	COURSE TITLE	L	T	P	C
201MBOEC	Open Elective: Wildlife Conservation	4	0	0	2

Aim:

To enable the students understand the need of conservation of wildlife in India.

Objectives:

- Maintenance of rare species in protected areas such as national parks, sanctuaries etc., Establishment of specific biosphere reserves for endangered plants and animals.
- Protection of wildlife through legislations such as banning hunting etc.,
- Imposing specific restrictions on export of endangered plants and animals or their products.

Course Outcome:

- Protection of natural habitats of organisms through controlled exploitation.
- Educating the public about the need to protect the environment
- Long range goal for preserve the wildlife for welfare of future generations
- Conservation and Maintenance of endangered plants in wildlife

Unit I:

Wildlife Management: Basic concepts and principles- Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA –

Evaluation of Wildlife habitat: Define habitat – Forest habitat types - basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect – Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species.

Unit II:

Introduction to conservation biology, the origin of conservation biology, ethical and economical values of conservation biology, definition of biodiversity, types of biodiversity, threats to biodiversity. Scopes and importance of conservation methods – *In-situ* and *Ex-situ* conservation approaches of Indian animals. Captive breeding (Lion-tailed macaque, white tiger and vultures) and reintroduction (Tiger, rhinoceros, gaur).

Unit III:

Biodiversity: Definition and importance - Biodiversity hotspots in India: Western Ghats, Eastern Himalayas. Mega diversity nations – an introduction. Landscape approach and people participation in biodiversity conservation.

UnitIV:

Role of Government and Non-Government organizations in conservation.– **Government** - Wildlife Institute of India, Ministry of Environment and Forests (MoEF), National Biodiversity Authority (NBA), Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Salim Ali Centre for Ornithology and Natural History (SACON), Centre for Ecological Sciences (CES). **NGOs**.– Bombay Natural History Society (BNHS), World Wide Fund for Nature (WWF), Wildlife Trust of India (WTI), Nilgiri Wildlife and Environment Association (NWEA), Wildlife Conservation Society (WCS).

UnitV:

Conservation Biology Tools– Biological Parks, Zoological Parks, Forest Research Institute, Agricultural Research Institutions, Gene Pools, Cryopreservation Centres, Interpretation Centres and role of Field Biologists.

References:

1. Anon, 1992. Conservation of biological diversity. Text and annexure – WWF-India.
2. Gaughley, G. and A. Gunn. 1995. Conservation Biology in Theory and Practice. Blackwell Publishers.
3. Dobson, A.P. 1996. Conservation and biodiversity scientific American Library, New York, USA.
4. John M. Fryxell, Anthony R. E. Sinclair and Graeme Caughley. 2014. Wild life Ecology, Conservation and Management. 3rd Ed. Wiley Blackwell Publi

COURSECODE	COURSE TITLE	L	T	P	C
201CAOEC	Open Elective –E-Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e-learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION**Introduction–**

Training and Learning, Understanding learning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, -Applications of e-learning.

UNIT II CONCEPTS AND DESIGN

E-Learning Strategy, the essential elements of learning strategy, Quality assurance in learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self-managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan Page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

COURSECODE	COURSE TITLE	L	T	P	C
201CSOEC	Open Elective-WebTechnology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice markup languages
- To learn Style Sheet and Frames

UNIT I

Introduction to the Internet: networking-internet-email-
Internet Technologies: modem internet addressing.

UNIT II

Internet browsers: Internet Explorer-Netscape navigator- Introduction to HTML: Html document- anchor tag-
hyperlink.

UNIT III

Head and body sections: Header section-titles-links-colorful webpage- sample html document-
Designing the body section: paragraph-tab setting.

UNIT IV

Ordered and unordered lists: list-unordered list-heading in a list-order list- nested list.

UNIT V

Table handling: tables-table creation in html cell spanning multiple rows and columns-coloring
cells-sample tables-frames frame set definition-nested frames set.

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them

- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design frontend web page and connect to the backend databases.

REFERENCE BOOKS

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

COURSECODE	COURSE TITLE	L	T	P	C
201TERP9	TALLY ERP 9	-	-	-	3

AIM

To develop the knowledge regarding the concepts of financial accounting in students that is used for learning maintain accounts.

OBJECTIVES

To impart practical knowledge in TALLY and ensures that finance for the company is always in order and is correct at all given points of time.

UNIT – I

TALLY – Introduction to Tally Prime –Difference between Tally Prime and Tally ERP 9 – New Features in Tally Prime

UNIT – II

Company Creation – Chart of Accounts

UNIT – III

Inventory Master and Inventory Vouchers in Tally

UNIT – IV

Payroll Master in Tally

UNIT –V

Reports in Tally

OUTCOME

Students are able to get placements in different offices as well as companies in Accounts departments.

REFERENCE BOOKS

1. Learn Tally Prime – Gaurav Agarwal

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RESEARCH INTEGRATED CURRICULUM

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student; both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyze their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research –Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and/or inquiry mode (i.e. the students become producers of knowledge not just consumers).

The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as, Level 1: P

described Research

Level 2: Bounded

Research Level 3: Scaffold

Research Level 4: Self-actuated R

esearch

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B.Com curriculum, the following Research Skill Based Courses are introduced in the B.Com curriculum.

Semester	RSB Courses	Credits
II	Research Led Seminar	1
III	Research Methodology	3
V	Participation in Bounded Research	2
VI	Project Work	4

Blueprint for assessment of student's performance in Research Led Seminar Course

● **Internal Assessment:** **40**
Marks

- Seminar Report (UG)/Concept Note (PG) : 5X4=20 Marks
- Seminar Review Presentation : 10 Marks
- Literature Survey : 10 Marks

● **Semester Examination :** **60**
Marks

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Research Methodology

Courses Continuous Internal Assessment: **20**

Marks

- Research Tools (Lab): 10 Marks
- Tutorial: 10 Marks

Model Paper Writing:

40Marks

- Abstract:
- Introduction:
- Discussion:
- Review of Literature:
- Presentation:

5 Marks

10Marks

10Marks

5Marks

10 Marks

Semester Examination:

40Marks

Total:

100Marks



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B.COM COMPUTER APPLICATION
PROGRAMME
Regulation 2020

Commerce is a professional course among the various arts subjects. Commerce is instrumental in bringing about changes in all aspects of the society. It promotes growth and development. The changes in the economic policies of the country and the computer application in business offer variety of opportunities for innovative and creative people to carry out their career with new vigor and enthusiasm.

In the present scenario the market based system has gradually expanded across the world securing a strong position in the market overcoming all borders and barriers.

The rapid changes in the field of economics, information technology, politics and also in the organizational structure and the increased complexities of the business world poses series of problems to the modern commerce student. At this backdrop the new syllabus is designed for the B.Com Computer Applications Programme of the **PRIST UNIVERSITY**



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SCHOOL OF COMMERCE AND BUSINESS MANAGEMENT

DEPARTMENT OF COMMERCE

B.Com, COMPUTER APPLICATION- REGULATION

2020 COURSE STRUCTURE

SEMESTER – I

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami-I/AdvancedEnglish-I/Hindi-I/French -I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20198SEC13	FinancialAccounting	3	1	1	3
20198SEC14	BusinessManagement	3	1	1	4
20198AEC15	InformationTechnology	3	0	0	2
20198AEC16	OperatingSystem	3	0	0	2
Total		21	3	3	17
AUDIT COURSE					
201LSCIC	IndianConstitution	-	-	-	2
201LSCUV	UniversalHumanValues	-	-	-	2

SEMESTER – II

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil-II/AdvancedEnglish-II/Hindi-II/French – II	4	0	0	2
20111AEC22	English-II	4	0	0	2
20198SEC23	BusinessAccounting	5	1	0	4
20198AEC24	BusinessLaw	4	1	0	4
20198AEC25	ProgramminginC	4	1	0	4
PRACTICAL					
20198SEC26L	ProgramminginCLab	0	0	3	2
RESEARCH SKILL BASED COURSE					
1					
20198RLC27	Research LedSeminar	-	-	-	1
Total		21	3	3	18
AUDIT COURSES					
201LSCCS	CommunicationSkills	-	-	-	2
201SSCBE	BasicBehavioralEtiquette	-	-	-	2

SEMESTER–III

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil– III/Hindi-III/AdvancedEnglish-III/French–III	4	0	0	2
20111AEC32	English-III	1	1	1	1
20198SEC33	CostAccounting	3	1	2	4
20198SEC34	BankingTheoryLaw andPractice	3	0	1	4
20198AEC35	ProgramminginC++	2	1	0	3
PRACTICAL					
20198AEC36	ProgramminginC++lab	0	0	3	2
RESEARCHSKILLBASEDCOURSE					
20120RMC37	ResearchMethodology	2	0	0	2
	Total	18	2	6	19
AUDITCOURSE					
201LSCOA	OfficeAutomation	1	1	1	2

SEMESTER–IV

CourseCode	CourseTitle	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 19135AEC41	Tamil-IV/AdvancedEnglish-IV/Hindi-IV/French–IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20198SEC43	Auditing	3	1	1	3
20198SEC44	BusinessStatistics	3	1	2	4
20198AEC45	VisualBasicProgramming	3	0	0	4
201ENSTU47	EnvironmentalStudies	2	0	0	2
PRACTICAL					
20198AEC46L	VisualBasicProgrammingLab	0	0	3	2
	Total	19	2	6	19
AUDITCOURSE					
201LSCLS	Leadershipand ManagementSkills	1	1	1	2
201SSCAQ	GeneralAptitude andQuantitativeAbility				2

SEMESTER –V

CourseCode	CourseTitle	L	T	P	C
THEORY					
20198SEC51	CorporateAccounting	4	1	3	4
20198SEC52	BusinessEconomics	3	1	1	4

20198SEC53	FinancialManagement	3	1	2	4
20198SEC54	SoftwareEngineering	3	1	0	4
20198DSC55_	DisciplineSpecificElective-I	3	0	1	2
RESEARCHSKILLBASEDCOURSE					
20198BRC56	ParticipationinBounded Research	-	-	-	1
	Total	16	4	6	19
AUDITCOURSE					
201ACLSPSL	ProfessionalSkills	-	-	-	2

SEMESTER-VI

CourseCode	CourseTitle	L	T	P	C
THEORY					
20198SEC61	ManagementAccounting	-	-	-	-
20198SEC62	IncomeTaxLawandPractice	3	1	1	5
20198SEC63	DatabaseManagementSystem	3	1	1	4
20198DSC64_	DisciplineSpecificElective-II	3	0	2	2
201_ OEC(2 Digit CourseNa me)	OpenElective	4	0	0	2
20198PRW66	ProjectWork	-	-	-	4
20198PROEE	ProgramExit Examination	-	-	-	1
	Total	16	3	6	23
AUDITCOURSE					
201SSCIM	InterviewSkillsTrainingandMockTest	-	-	-	2
201LSCCE	CommunityEngagement	-	-	-	1
201TERP9	Tally ERP9	-	-	-	3
TotalCredits-Programme					115
TotalCredits-AuditCourses					19

DISCIPLINESPECIFICELECTIVE

SEMESTER	COURSECODE	COURSE TITLE
V	20198DSC55A 20198DSC55B	ManagementInformationSystem StockMarket Practice
VI	20198DSC64A 20198DSC64B	E- CommerceWeb Designing

OPENELECTIVE

SEMESTER	COURSE CODE	COURSE TITLE
VI	201TAOEC 201ENOEC 201MAOEC 201PHOEC 201CHOEC 201MBOEC 201CSOEC 201CAOEC	TamilIakkiyaVaralaruJ ournalism DevelopmentofMathematicalSkillsI nstrumentation Food and AdulterationWildLifeC onservationWebTechn ology E-Learning

B.Com– CA CreditDistribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	10	06	-	-	-	01	17
II	10	07	-	-	01	-	18
III	10	07	-	-	02	-	19
IV	09	07	-	-	-	03	19
V	-	16	02	-	01	-	19
VI	-	16	02	02	-	03	23
Total	39	59	04	02	04	07	115

CourseCode	CourseTitle	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம்- வல்லம் தஞ்சாவூர்

தமிழ்

முதல் பருவம்

முதலாம் ஆண்டு - (BBA , BA , B.COM, CS ,Bsc)

இக்கால இலக்கியம் - செய்யுள், சிறுகதை , நாடகம், இலக்கிய வரலாறு

அலகு : 1.செய்யுள் :

1. தாயுமானவ சுவாமிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்
2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்
3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்
4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்
5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள் - தமிழ் இனிமை , தமிழ் உணர்வு

அலகு : 2. செய்யுள்:

6. நாமக்கல் கவிஞர் - தமிழ் தேன், தமிழ் வளர்ச்சி சபதம் செய்வோம் , 40 அடிகள்
7. ந.பிச்சமுர்த்தி - வழித்துணை - கவிதை கருடன் , 42 அடிகள்
- 8.கரதா - தேன்மழை, கலப்பை , 22 அடிகள்
9. கண்ணதாசன் - இலக்கியம் , ஒரு பாணையின் கதை , 54 அடிகள்
10. அப்துல் ரகுமான் - சொந்த சிறுகுகள், குப்பையை கிளறும் சிறுகுகள், 80 அடிகள்

அலகு : 3. சிறுகதை :

11. க.சமுத்திரம் - வேரில் பழுத்த பலா

அலகு : 4. நாடகம் :

12. கு. வெ. பாலசுப்பிரமணியன் , கௌதம புத்தர் (உரைநடை நாடகம்)

அலகு : 5. இலக்கிய வரலாறு

13. சிறுகதை , புதினம், நாடகம் உரைநடை , கவிதை , புதுக்கவிதை

CourseCode	CourseTitle	L	T	P	C
20111AEC11	AdvancedEnglish-I	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

CourseObjective:

- To familiarizewith theglossaryterms, figuresofspeech
- To enhancevocabulary
- Tolearnhowto editandproofread
- Toknowthecomparisonandcontrastandcause andeffectforms
- Tounderstandtheimpactof thespeechesof famouspeople

CourseOutcome:

- Developvocabulary
- Learntoeditand doproofreading
- Readandcomprehendliterature

UNIT – I

Glossaryof grammarterms, Figuresofspeech

UNIT – II

Foreignwordsandphrases, BritishandAmericanVocabulary

UNIT – III

Comparisonandcontrast, Causeandeffect

UNIT – IV

Editing, Proofreading

Employability

UNIT – V

Speechesof famouspeople:

MahatmaGandhi- Abraham Lincoln-SwamiVivekananda-JohnF. Kennedy

Referencebook:

Author	Titleofthe book	Edition/ Year	Publisher
WrenandMartin	EnglishGrammar	2009	S.Chand&CompanyLtd
MeenakshiRaman& SangeethaSharma	Technical Communication	SecondEdition 2011	OxfordUniversityPress
SudhirKumarSharma	The World’s Great Speeches	-	GalaxyPublishers

CourseCode	CourseTitle	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- i. To acquaint with learning English through literature

Objective:

- ii. To improve English delightfully through simple poems, essays
- iii. To throw light on fiction
- iv. To read and comprehend literature

Outcome:

- v. Read and comprehend literature
- vi. Appreciate the different types of poetry and prose

UNIT – I

Because I could not stop for Death -Emily

Dickinson Stopping by Woodson a Snowy Evening -Robert

Frost UNIT – II

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K.Ramanujam

UNIT – III

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT – IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT – V

Oliver Twist -Charles Dickens

Textbook:

Author	Title of the book	Edition/ Year	Publisher
S.Murugesan/Dr.K.Chellappan	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

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COURSE CODE	COURSE TITLE	L	T	P	C
20198SEC13	Financial Accounting	4	1	0	4

AIM:

- This programme is designed to provide high quality education in theoretical and practical knowledge and skill in various aspects of accounting

OBJECTIVE: you should be able to

- Define accounting and trace the origin and growth of accounting.
- Explain the nature and objectives of accounting.
- Discuss the branches, role and limitations of accounts

UNIT-I

Definition of 'account' — the nature, Objects and utility of accounting in Industrial and Business enterprises — Books for accounts — Accounting concepts and postulates.

UNIT-II

The theory of double entry — bookkeeping — Journal — Subsidiary books — Ledger Trail Balance.

UNIT-III

Statement of accounts — Manufacturing account — Trading account — Profit and Loss account.

UNIT-IV

The Balance sheet and various forms it may take. Capital and revenue — income and expenditure account — Receipts and payments. Depreciation, reasons and provisions.

UNIT-V

Consignment- meaning, features of consignment transaction, distinction between consignment and sale, joint venture, meaning, features, difference 'between joint venture and partnership, joint venture and consignment.

Employability

OUTCOME:

- Understanding the fundamental of financial accounting
- Develop the modern market economy
- prepare the different kinds of financial statement
- Acquire conceptual knowledge of basics of accounting
- Identify and analyze the reasons for the difference between cash book and pass book balances
- Develop the skill of recording financial transactions and preparation of reports in accordance with GAAP
- The course helped the students the principles and objectives of basic Financial accounting.

Text Book Reference:

1. Advanced Accounting — S. P. Jain and K.L. Narang — Kalayani Publisher.
2. Principles of Accounting — Finney H.A. Miller H.E., PHL Auditing — Tandon

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COURSE CODE	COURSE TITLE	L	T	P	C
20198SEC14	Business Management	3	1	0	3

AIM

- One can apply functional and foundational concepts to think critically and solve business problems.

OBJECTIVES: Students will learn

- To enable business managers to get the concept of how to manage business venture effectively and efficiently.
- Enhance the skills of managers and in this changing business environment.
- To equip managers, employees and potential employees with the knowledge, skills and attitude that they need for effective business management.

UNIT-I

Business Management — Nature — Functions — Management
Vs Administration — Science or Art — Contribution by Taylor and Henry Fayol & Peter Drucker

UNIT-II

Planning — Process — Kinds of Planning — Objectives — Strategies, Policies, Procedure, Methods and rule — Forecasting and Planning — Advantages & Limitations - Management by Objectives.

UNIT-III

Organizing — Process — Features — Elements — Structure — Different Forms — Principles of Organization — Departmentation, Delegation and Decentralization
Employability

UNIT-IV

Staffing — Process - Manpower planning — Recruitment — Selection — Training and development

UNIT-V

Directing and Co-ordination: Principles — Elements — Controlling — Steps.

OUTCOME:

- Apply conceptual learning skills in today's business environment.
- Analyze financial performance of an organization.
- Evaluate organizational decisions with consideration of the political, legal and ethical aspects of business.
- Understand relationship between environment and business; Applying the environmental analysis techniques in practice
- Assess strengths, weaknesses, opportunities and threats of the business environment.
- Know state policies, Economic legislations and Economic reforms laid by the government

Reference Books

1. L.M.Prasad -Principles of Management
2. Dinker Pagare -Business Organization and Management
1976

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COURSECODE	COURSE TITLE	L	T	P	C
20198AEC15	Information Technology	3	1	0	4

AIM

- To provide opportunity for the study of modern methods of information processing and its applications

OBJECTIVES

- Show an awareness of what the major computer components are and how they act as a system
- appreciate that computers need instructions to operate and acquire simple programming skills

UNIT-I:

Information Concepts and Processing: Concepts of data, data type, information, need for information evolution of information processing.

UNIT- 2:

Elements of computer processing systems: Classification of computers, Hardware CPU, storage devices and media, Software systems and applications.

UNIT-3:

Programming languages, Machine language, assembly language, high-level language, Fourth generation language, compilers, interpreters.

UNIT-4:

General Concept of OOPS (Object oriented programming) Operating Systems: Concept and function of Operating system.

UNITE-5:

Batch processing, Multiprogramming, Realtime, timesharing, distributed system.

Skill development

OUTCOME:

- Perform end user support including identifying and implementing solutions to user requests.
- Analyze technical requirements to determine resource requirements and the impact the solution will have on an organization.
- Design, plan, budget and propose an IT project for an identified need within a specific scope.
- Install technical hardware and software including network, database and security components.
- Perform routine maintenance to maintain the currency of an operating system, network, database and security needs.
- Identify and resolve technical problems using trouble-shooting and research techniques.
- Analyze and select application and operating system settings to create an optimal user environment.

References:

1. "Computer Fundamentals" by P.K. Sinha
2. Sanders, D.H. "Computer today" Mc-Graw-Hill, 1988
3. S. Jaiswal, "Information Technology today", Galgotia Pub., New Delhi 1999,

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COURSECODE	COURSE TITLE	L	T	P	C
20198AEC16	OperatingSystem	3	0	3	2

AIM:

- Provide proficiency skill of operating system to the target students

OBJECTIVES

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS

UNIT- I

Evolution of Operating Systems — Types of Operating Systems — Different views of OS — Design and implementation of Operating Systems — I/O Programming concepts — Interrupt structure and Processing.

UNIT-II

Memory management: Single contiguous allocation — Partitioned Allocation — Relocatable Partitioned Allocation — Paged and Demand Pages Memory Management — Segment Memory Management — Segmented and Demand Paged Memory Management — Swapping and Overlay Techniques.

UNIT- III

Processor management: Job Scheduling — Process Scheduling — Functions and Policies — Evaluation of Round Robin Multiprogramming performance — Process synchronization — Race condition — Synchronization Mechanism — Deadly Embrace Prevention and Detect and Recover Methods.

Skill development

UNIT- IV

Device management: Techniques for device management — Device Characteristics — I/O Traffic controller, I/O scheduler, I/O device handler — Virtual Devices Spooling

UNIT-V

File management: Simple file system, General Model of a file system, Physical and Logical file system. Case studies: DOS, UNIX/LINUX Operating systems

OUTCOMES:

- Describe and explain the fundamental components of a computer operating system. [ABET(a), (i),(j),(k)] Assessment: Students will take midterm exams, final exams, and homework
- Describe and explain the fundamental components of a computer operating system. [ABET(a), (i),(j),(k)] Assessment: Students will take midterm exams, final exams, and homework.
- Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems. [ABET(a),(i),(j),(k)] Assessment: Students will take midterm exams, final exams, and homework.
- Describe and extrapolate the interactions among the various components of computing systems.
- [ABET(a),(i),(j),(k)] Assessment: Students will take midterm exams, final exams, and homework

CourseCode	CourseTitle	L	T	P	C
201ACLSICN	IndianConstitution	-	-	-	2

CourseObjectives:

- To makethe students understand about the democratic rule and parliamentary administration
- To appreciate the salient features of the Indian constitution
- To know the fundamental rights and constitutional remedies
- To make familiar with powers and positions of the union executive, union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Course outcome:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights are established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution-socialism–secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion-cultural and educational rights-right to constitutional remedies-fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Skill development

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabha -Lok Sabha .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

- 1) Palekar. s. a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishna swami, Constitution and fundamental rights 1955.
- 3) Markandan. k. c. directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, Our parliament, National book trust, New Delhi 1989

CourseCode	CourseTitle	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives:

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realize their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who
- are remembered in history for practicing compassion and love. Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn/gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or
- group experience(s) Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth has value, truth has fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this
- value Narratives and anecdotes from history, literature including local folklore
- e
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?

- Learners' individual and/or group experience(s) in simulated situations
- Casestudies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy, sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and ways of overcoming greed. Renunciation with attachment and true renunciation

- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

SEMESTERII

CourseCode	CourseTitle	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம் வல்லம் தஞ்சாவூர்
பாட குறியீடு :

தமிழ்

இரண்டாம் பருவம்

முதலாம் ஆண்டு - (BA, Bsc, B.COM, BBA)

செய்யுள், சக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கிய வரலாறு

அலகு : 1. செய்யுள்:

1. திருஞானசம்பந்தர் தேவாரம் - கோளறு பதிகம்
2. திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை
3. சுந்தரர் தேவாரம் - திருநொடித் தான் மலை
4. மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2. செய்யுள்:

5. குலசேகராழ்வார் - பெருமாள் திருமொழி
6. நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்
7. ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
8. திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3. செய்யுள்:

9. தினமலர் - மூன்றாம் திருமுறை
10. குமரகுருபரர் - மீனாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்
11. திரிசூடராசப்ப கவிராயர் - குற்றால குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்
12. வீரமாமுனிவர் - திருக்காவ லூர்க் கலம்பகம்

அலகு : 4. புதினம்

13. கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5. இலக்கிய வரலாறு

14. சைவ வைணவ இலக்கியங்கள், சிற்றிலக்கியங்கள், (பள்ளு - பிள்ளைத்தமிழ், - பரணி)

CourseCode	CourseTitle	L	T	P	C
20111AEC21	AdvancedEnglish-II	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- Tounderstandtheformatofe-mail,faxand memos
- Towriteitinerary, checklist,invitation,circular,instruction,recommendations
- Tounderstandtheimpactofthebiographiesof famous people

Outcome:

- Developtechnologicalskill
- Ableto writein a varietyof formats
- Readbiographies anddevelop personality

UNIT -I

E-mail,Fax,Memos

UNIT - II

Itinerary,Checklist

UNIT - III

Invitation,Circular

UNIT - IV

Instruction,Recommendations

UNIT - V

Biographiesoffamouspeople:MotherTeresa-MadamCurie-CharlesChaplin- VikramSarabhai

TextBook

Author	Titleofthe book	Edition / Year	Publisher
MeenakshiRaman & Sangeetha Sharma	TechnicalCom munication	2011	OxfordUniversityPress
Rajendra Pal &J.S.Korlahalli	Business Communication	2015	Sultan

CourseCode	CourseTitle	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Acquire language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology - A.K.Ramanujan

Gift - Alice Walker

The First Meeting - Sujata Bhatt

UNIT – II

Fueled - Marcie Hans

Asleep - Ernst Jandl

Buying and selling - Khalil Gibran

UNIT – III

The End of living and The Beginning of Survival -

Chief Seattle My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee - K.A. Abbas

I Have a Dream - Martin Luther King

Those People Next Door - A.G. Gardiner

UNIT – V

Marriage is a private Affair - Chinua Achebe

The Fortune Teller - Karel Capek

Proposal - Anton Chekov

Textbook:

Author	Title of the book	Edition / Year	Publisher
Gowri Sivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC23	BusinessAccounting	5	1	0	4

AIM:

- To learn the accounting mechanism this is necessary for Business Accounting.

OBJECTIVES

- I. To ascertain the Profit of Branches & Departments.
- II. To learn Hire Purchase and Royalties Accounting.
- III. To practice Partnership Accounting.

UNIT-I

Final Accounts of a Sole Trader – Adjustments.

UNIT-II

Departmental accounts – Hire purchase accounts – Royalty accounts.

UNIT-III

Average due Date – Sale or Return – Bills of Exchange

UNIT-IV

Depreciation – Methods – Fixed – Diminishing – Annuity – Depreciation Fund – Provision and Reserves.

UNIT-V

Partnership Fundamentals – Partnership – Final Accounts
Employability

OUTCOMES:

- familiarize the concept of Branch account and its system
- understand the Scope of departmental accounting
- Appreciate the need for negotiable instruments and procedure of accounting for bills honoured and dishonoured
- Differentiate Trade bills from Accommodation Bills
- Understand the concept of Consignment and learn the accounting treatment of the various aspects of consignment
- Distinguish Joint Venture and Partnership and to learn the methods of maintaining records under Joint Venture
- Understand the meaning and features of Non-Profit Organizations
- Learn to prepare Receipts & Payment Account, Income & Expenditure Account and Balance Sheet for Non-Profit Organizations

Reference Books:

1. Jain, S.P. and K.L. Narang. Financial Accounting. Kalyani Publishers, New Delhi.
2. S.N. Maheshwari, Financial Accounting, Vikas Publication, New Delhi. T.S, Grewal, Introduction to Accounting, S. Chand and Co., New Delhi
3. Accounting for Managers – J. Made Gowda – Himalaya Publishing House
4. Financial Accounting Reddy and Murthy

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COURSE CODE	COURSE TITLE	L	T	P	C
20198SEC24	Business Law	4	1	0	4

AIM

- Developing proficiency skill of Business law

OBJECTIVE

1. Undertake and promote research on Business laws & attract students of the highest caliber to the Law School's programs and
2. Provide opportunities for their involvement in Business law research projects.

Unit I

Nature and Sources of law — Law of contracts — Essentials of valid contract —

Classification of contracts

Unit—II

Offer and acceptance — consideration -- capacity to contract — Free consent Legality of

object

Unit—III

Performance of contracts — Discharge of contract — Remedies for breach of contract — Quasi contracts

Unit—IV

Contracts of agency — Different classes 'of agents — creation of agency — Rights and duties of an agent -- scope of agents authority — Liability of principles to third parties — Personal liability of agent — Bailment and pledge.

Unit— V

Contract of Indemnity and guarantee — Rights of Indemnity holder — Rights of surety — Nature and extent of surety's liabilities

Employability

OUTCOME:

- Explain the concepts in business laws with respect to foreign trade
- Apply the global business laws to current business environment
- Demonstrate an understanding of the Legal Environment of Business.
- Communicate effectively using standard business and legal terminology.
- Demonstrate recognition of the requirements of the contract agreement
- Identify contract remedies
- understand the various provisions of Company Law

Reference Books:

1. N.D. Kapoor — Elements of commercial law.
2. MLC. Shukla — Mercantile law.
3. P.P.S. Gogna — A Text book of Business Law.
4. S.N. Maheswari — Mercantile law. 1990

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COURSECODE	COURSE TITLE	L	T	P	C
20198AEC25	Programming in C	4	1	0	3

AIM

- This course is aimed at advancing concepts of programming and software code organization within the framework of structural and procedural programming paradigms.

OBJECTIVE

- Students will be able to develop logics which will help them to create programs, applications in C
- Also by learning the basic programming constructs they can easily switch over to any other language in

UNIT-I

Evolution and Applications of C — Structure of a C Program — Data Types — Declarations — Operators — Expressions — Type conversions — Built-in functions.-

UNIT-II

Data Input and Output — Control statements: if, else-if, goto, switch, while-do, do-while, for, break & continue.

UNIT-III

Functions: Defining and accessing functions-passing parameters of functions- Arguments - Recursive functions — Storage classes, Arrays: Defining and processing Arrays + Multi dimensional arrays — passing arrays to functions ~ Arrays and strings — String functions — String Manipulations.

UNIT-IV

Pointers: Pointers Declarations — Operations on pointers — pointers to functions — Pointer and Strings — pointers and arrays — array of pointers Structures: Structures and pointers — unions.

UNIT-V

Data files - Opening, Closing, and processing files — Files with structures and unions — Register variables — Bitwise Operations-Macros-Preprocessing.
Skill development

OUTCOMES:

- Understanding a functional hierarchical code organization.
- Ability to define and manage data structures based on problem subject domain.
- Understanding a concept of object thinking within the framework of functional model.
- Understanding a concept of functional hierarchical code organization.
- Understand operators, expressions and preprocessors.
- Understand arrays, its declaration and uses.

Book for Reference:

- “Programming with C” — Byron S. Gottfried — Schaum’s outline series — Tata McGraw-Hill publications.
- Letus C “~Yeswantkanetkar—BPB Publications.
- “Programming in C” ~E. Balagurusamy—Tata McGraw-Hill Publications

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COURSECODE	COURSE TITLE	L	T	P	C
20198AEC26L	Programming in C Lab	0	0	3	2

AIM

- Focusing on discussing how to write a program of moderate complexity by using C language.

OBJECTIVE

1. Ability to work with textual information, characters and strings.
2. Understanding a concept of object thinking within the framework of functional model
 1. Solution of a Quadratic Equation (all cases)
 2. Sum of Series (Sine, Cosine, e)
 3. Ascending and descending order of number using Arrays (Use it to find largest and smallest numbers).
 4. Sorting of names in Alphabetical order.
 5. Write a C program for Matrix Operations (Addition, Subtraction, Multiplication - use functions).
 6. String Manipulation without using String functions (String length, String Comparison, String Copy, Palindrome checking, counting words and lines in strings — use function pointers).
 7. Creation and processing of Sequential files for Mark list preparation (Use Structures for Record Description)
 8. Develop an Invoice application
 9. Payroll preparation
 10. EB bill preparation

OUTCOME:

- Develop their programming skills.
- Declaration of variables and constants
- Be familiar with programming environment with C Program structure.
- Ability to work with textual information, characters and strings
- Understanding a defensive programming concept. Ability to handle possible errors during program execution
- Understanding a functional hierarchical code organization. Ability to define and manage data structures based on problem subject domain.

SEMESTER II
COMMUNICATIONS SKILLS

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Course Objectives:

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome:

By the end of this program, participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text
 - ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV

- Clearly state the claims

- Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - i. Category groupings
- Different modes of Writing-
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - i. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in the workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - i. Excel
 - iv. Powerpoint

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to I Marketing

Unit VII

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhuchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P.J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

SEMESTER-III

CourseCode	CourseTitle	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

• பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம் வல்லம், தஞ்சாவூர்
பாட குறியீடு : 20110AET31
தமிழ்
மூன்றாம் பருவம்
முதலாம் ஆண்டு (BA , Bsc , B.COM, BBA)
செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு
செய்யுள்
அலகு : 1
1 . சிலப்பதிகாரம் - மனையறம் படுத்த காதை
2 . மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3 . சுவக சிந்தாமணி - விமலையர் இலம்பகம்
அலகு : 2
4 . பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
5 . கம்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்
அலகு : 3
6 . சூறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
7 . தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்
அலகு : 4
8 . நளவெண்பா - சுயம்வர காண்டம் (20 - 51)
அலகு . 5 : இலக்கிய வரலாறு
9 . காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

CourseCode	CourseTitle	L	T	P	C
20111AEC31	AdvancedEnglish-III	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

CourseObjective:

- Tofamiliarizewiththeorgansofspeech andthedescriptionandclassificationofspeechsounds
- Tounderstandconsonantcluster,syllable,wordaccentandintonation.
- Toknowhowtointerpretgraphics
- Towriteslogans andadvertisements

CourseOutcome:

- Understandphonetics
- Developwritingskill
- Abletodevelopcreative writing

UNIT – I

Theorgansofspeech,Classificationofspeechsounds,VowelsandDiphthongs

UNIT – II

Consonants,Consonantcluster

UNIT – III

Syllable, Wordaccent, Intonation

UNIT – IV

Idiom, Interpretationofgraphics

UNIT – V

Sloganwriting, Writingadvertisement

REFERENCEBOOKS:

Author	Titleofthe book	Edition/ Year	Publisher
T.B.Balasubramaniyan	AtextbookofPhoneticsfor IndianStudents	Reprint2008	Macmillian
Meenakshi Sharma & SangeethaSharma	TechnicalCommunication	2011	OxfordUniversityPress

CourseCode	CourseTitle	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Course Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Course Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – I

The Doctor's World - R.K. Narayan

The Postmaster - Rabindranath Tagore

Princess September - E. Somerest Maugham

UNIT – II

The Price of Flowers - Prabhat Kumar Mukhopadhyay

The Open Window - Saki

The Model Millionaire - Oscar Wilde

UNIT – III

My Brother My Brother - Norah Burke

Uneasy Home Coming - Will F. Jenkins

Resignation - Premchand

UNIT – IV

The Referee -

W.H. Andrews & Geoffrey Dreamer The Case of the Stolen Diamonds -

Farrell Mitchell

UNIT – V

The Dear Departed -

Stanley Houghton The Princess and the Wood Cutter -

Alan Alexander Milne **Textbook:**

Author	Title of the book	Edition/ Year	Publisher
Steuart H. King	Nine Short Stories	Reprint 2001	Blackie Books
T. Prabhakar	One-Act Play		Emerald

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COURSECODE	COURSETITLE	L	T	P	C
20198SEC33	CostAccounting	3	1	2	4

AIM

- To ascertain the costs of products manufactured or services rendered and exercising control over the expenditure.

OBJECTIVES

- To know the cost of each process and each element.
- To serve management in the execution of policies according to the situations.

UNIT – I

Cost accounting definitions – Functions, Importance, Advantages and Limitations – Relationship between cost and Financial Accounting – Installation of costing system – Cost Unit and Cost Centre – Elements of Cost – Cost sheet – Tender and quotation.

UNIT – II

Materials cost control – Material Purchases – Storage of Material – Various levels of Stock – Pricing of Materials Issues.

UNIT – III

Labour Cost Control – Piece and Time Rates – Incentive Plans – Labour turnover – Idle time – Overheads – Allocation – Apportionment – Re Apportionment and Absorption.

UNIT -IV

Process Costing (Excluding Inter Process, Equivalent Production – By product – Joint product) and Operating Costing.

UNIT -V

Contract Costing – Reconciliation of Cost and Financial Accounting.

Employability**OUTCOME:**

- Understand various costing systems and management systems
- Analyze and provide recommendations to improve the operations of organizations
- Imbibe conceptual knowledge of cost accounting.
- Understand the significance of cost accounting in the modern economic environment
- Select the costs according to their impact on business
- Apply cost accounting methods to evaluate and project business performance

REFERENCE BOOKS

- Palekhar & Pattan Shetty – Costing.
- Jain & Narang – Cost Accounting.
- S.P. Iyengar – Cost Accounting.
- Ahuja & Others – Cost Accounting.
- R. Srinivasan & R. Ramachandran – Cost Accounting.

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COURSECODE	COURSETITLE	L	T	P	C
2019SEC34	BankingTheoryLaw andPractice	3	0	1	4

AIM

- To provide a comprehensive view of Banking Services to know the application of BankingTheoryLawand Practice.

OBJECTIVES

- I. Tohighlightthe functionsand servicesofamodernbank.
- II. Tounderstandtherelationshipbetweenbankerand customer.
- III. Tolearnlaw relatingto Negotiable Instruments, SecuritiesandAdvances.

UNIT – I

Bank and Banking – Role and importance of Banking – Classification of Commercial Banks – FunctionsofcommercialBanks–Investment Policyof aCommercial Bank–Functions ofRBI.

UNIT – II

E – Banking – Forms of E- Banking Automatic Teller Machine (ATMS) – Credit Cards, DebitCards – Types of Credit Cards – Types of Bank Accounts – Types of Deposits – Electronic FundsTransfer.

UNIT – III

SpecialTypesof Bankcustomers–ThePayingBanker–TheCollectingBanker.

UNIT – IV

Negotiable Instruments – Characteristics – Parties to Negotiable Instruments – Endorsement – Typesof Endorsement.

UNIT – V

Bills ofexchangeand Promissorynotes– Cheques and Bank Drafts Crossingof Cheques.

Employability**OUTCOME:**

- Understandingof BankingChannelsandPayments
- PracticesonBankingTechnology
- Understandingof CoreBanking
- Togatherknowledgeonbankingandfinancialsystemin India
- Understandbettercustomerrelationship
- Tocreatawarenessaboutmodernbankingserviceslikee-banking,m-bankingand internetbanking

REFERENCEBOOKS

1. B.S.Raman-Banking, Theory, LawandPractice
2. S.M.Sundaram -BankingTheoryLaw andPractice
3. VarshneyandSundaram-A TextBookonBankingTheoryLaw Practice
4. K.P.M.Sundaram-BankingTheoryLaw andPractice

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COURSECODE	COURSE TITLE	L	T	P	C
20198AEC35	Programming in C++	2	1	0	3

AIM:

- Implement several programs in languages other than the one emphasized in the core curriculum (Java/C++)

OBJECTIVES:

- To understand how C++ improves C with object-oriented features.
- To learn how to write inline functions for efficiency and

performance.

UNIT-I

Object oriented programming: Software evolution - OOP Paradigm- concepts, benefits, Object oriented languages and applications.

UNIT-II

Introduction to the basic concepts of C++ language - Tokens, keywords, identifiers, data type, variables, manipulators- expression and control structures - functions: main function - function prototyping - call by reference function overloading - friend and inline functions.

UNIT-III

Classes and objects- constructors and destructors - operator overloading- type conversions.

UNIT-IV

Inheritance - single inheritance - multiple inheritances - hierarchical, hybrid inheritance - polymorphism- pointers- virtual functions- console I/O operations.

UNIT-V

Files - Classes for file stream operations - opening, closing and processing files - end of file detection - file pointers - updating a file - error handling during file operations - command line arguments - templates - exception handling.

Skill development

OUTCOMES:

- To know the proper lines of C++, Encapsulation, Inheritance and Polymorphism.
- To explain the various data types, operations and functions of C++.
- To know the concept of constructors and destructors.
- To explain the concept of inheritances, types of inheritance and polymorphism, virtual Functions.
- To explain the types of streams, format and format of input and output operations.
- To Know the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.

REFERENCE BOOKS:

1. "Object oriented programming with C++". E. Balagurusamy, Tata McGraw Hill publishing Ltd., New Delhi, 1995.

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COURSECODE	COURSETITLE	L	T	P	C
20198AEC 36L	Programming in C++ lab	0	0	3	2

AIM:

- Use C++ to demonstrate practical experience in developing object-oriented solutions

OBJECTIVES:

- Analyse a problem description and design and build object-oriented software using good coding practices and techniques
 - design and implement programs using C++
1. Write C++ program using a class to represent a bank account with data members- name of depositor, account number, type of account, balance and member functions - deposit amount, withdraw amount, show Name and balance. Check the program with your own data.
 2. Design an abstract base class "Shapes" and derive three classes "Rectangle", "Circle" and "Triangle". Develop polymorphic functions "Circumference" and "Compute-Area" to calculate the circumference and area of these objects and display it. Develop a main program to create each of these and apply these polymorphic functions.
 3. Write C++ programs for implementing inheritance.
 4. Write a C++ program to illustrate inline functions.
 5. Write a C++ program using friend operator function.
 6. Write a C++ program to illustrate virtual base class, virtual function and abstract class.
 7. Write a program which reads a text from a file and then display the following information.
 8. Number of Lines
 9. Number of words.
 10. Number of characters.
 11. Strings should be left-justified and numbers should be right-justified in a suitable field width.
 12. Write a C++ program to implement file concept: Create a file and store some text, display the content of the file with line numbers.
 13. File Processing: Marks sheet preparation.
 14. File Processing: Inventory preparation.

OUTCOME:

- To know the proper lines of C++, Encapsulation, Inheritance and Polymorphism.
- To explain the various data types, operations and functions of C++.
- To know the concept of constructors and destructors.
- To explain the concept of inheritances, types of inheritance and polymorphism, virtual Functions.
- To explain the types of streams, format and format of input and output operations.
- To know the procedural and object oriented paradigm with concepts of streams, classes, unions, data and objects.

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COURSECODE	COURSE TITLE	L	T	P	C
20198RMC37	Research Methodology	2	0	0	2

AIM

- To create a basic appreciation towards research process and awareness of various research publications.

OBJECTIVES

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features.
- To carry out basic literature survey using the common data-bases.

PREREQUISITES:

Basic computer skills for working in window-environment & Conceptual knowledge on basic matrices.

UNIT – I

Research in Management: An Introduction – Definition, meaning and nature – Scope and objects of Research. Types of Research.

UNIT – II

Research Design – Defining Research Problem and Formulation Of Hypothesis – Experimental Designs – Sampling and types of sampling.

UNIT – III

Research Process – Steps in the process of Research, Data Collection and Measurement: Sources of Secondary data – Methods of Primary data collection – Questionnaire Construction. **UNIT – IV**

Data presentation and Analysis – Data Processing – Methods of Statistical analysis and interpretation of Data – Testing of Hypothesis and theory of inference – Correlation and Regression analysis.

UNIT – V

Report writing and Presentation – Steps in Report writing – Types of reports – Formats of Reports – Presentation of a Report. Skill development

OUTCOME:

- Able to carry out independent literature survey corresponding to the specific publication type and assess basic literary research tools.
- Familiarize participants with basic of research and the research process.
- Enable the participants in conducting research work and formulating research synopsis and report.
- Develop understanding on various kinds of research, objectives of doing research, research processes, research designs and sampling.
- Have basic knowledge on qualitative research techniques
- Have adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis

REFERENCE BOOKS

- Rajendrapal and Korlahalli-Business Communication
- M.S.Ramesh and Pattenshetty-Effective Business English & Correspondence

3. SharmaandKrishnamohan-ReportwritingBusinessCorrespondence

SEMESTER III
COMMUNICATIONSKILLS

CourseCode	CourseTitle	L	T	P	C
201ACLSOAN	OFFICEAUTOMATION	-	-	-	2

Aim:

CourseObjectives:

To provide an in-depth training in the use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

CourseOutcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with the internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS Word)

UNIT III

Spread Sheet (MS Excel)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Skill Development

Reference:

1. Fundamentals of computers - V. Rajaraman - Prentice - Hall of India
2. Microsoft Office 2007 Bible - John Walkenbach, Herb Tyson, Faith Wempen, Cary N. Prague, Michael Rgroh, Peter G. Aitken, and Lisa A. Bucki - Wiley India Pvt. Ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha - Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

SEMESTER-IV

CourseCode	CourseTitle	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

• மின்னல் நிகழ்வினை பக்கவரைச்சுழுவம் வகைமை ,சுத்தொழி
 பாட குறியீடு : 20110AET41

தமிழ்
 நான்காம் பருவம்
 முதலாம் ஆண்டு (BA , BSC , B.COM , BBA)
 செயல்புள் , சங்க இலக்கியம் , அறு இலக்கியம் , செம்மொழி , இலக்கிய வரலாறு

அலகு . 1 : பண்டைய இலக்கியம் - நற்றிணை;

- 1 . நெய்தல் - தோழி கூற்று - பாடல் எண் . 11
- 2 . குறிஞ்சி - தலைவி கூற்று - பாடல் எண் . 64
- 3 . முல்லை - தலைவன் கூற்று - பாடல் எண் . 142
- 4 . பாலை - நற்றாய் கூற்று - பாடல் எண் . 29
- 5 . மருதம் - தலைவி கூற்று - பாடல் எண் . 70

குறுந்தொகை

- 1 . குறிஞ்சி - தோழி கூற்று - பாடல் எண் . 1
- 2 . முல்லை - செவிலித்தாய் கூற்று - பாடல் எண் . 167
- 3 . மருதம் - தலைவி கூற்று - பாடல் எண் . 181
- 4 . நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290
- 5 . பாலை - தலைவன் கூற்று - பாடல் எண் . 347

ஐங்குறுநூறு

- 1 . மருதம் - சன்வன் பத்து - முதல் இரண்டு பாடல்கள்
- 2 . நெய்தல் - தோழிக்கு அரைக்க பத்து - முதல் இரண்டு பாடல்கள்
- 3 . குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்
- 4 . பாலை - இளவேனிற பத்து - முதல் இரண்டு பாடல்கள்
- 5 . முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு . 2 : கலிந்தொகை

- 1 . பாலை - பாடல் எண் . 2
- 2 . குறிஞ்சி - பாடல் எண் . 37

அகநானூறு

- 1 . பாலை - பாடல் எண் . 5
- 2 . மருதம் - பாடல் எண் . 6

புறநானூறு

பாடல் எண் : 6 , 121 , 41 , 153 , 172 191 , 223 , 246 , 284 , 358 .

பதிற்றுப்பத்து

இரண்டாம் பத்து பாடல் எண் . 4 (நிலம் நாள் வளி விசம்பு)

அலகு . 3 ;

- 1 . பட்டினப்பாலை - முதல் 105 வரிகள்
- 2 . திருக்குறள் - 1.மருந்து 2.அகச்சமுடைமை 3.அழவு

அலகு . 4 : செம்மொழி வரலாறு ;

(மொழி - விளக்கம் , மொழிக்குடும்பங்கள் , உலகச் செம்மொழிகள் , இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள் , வாழும் தமிழ் செம்மொழி , தொன்மை , தமிழின் சிறப்புகள் , தமிழ் செம்மொழி நூல்கள்)

அலகு . 5 : இலக்கிய வரலாறு

சங்க இலக்கியங்கள் , பதினெண்குழக்கணக்கு நூல்கள் .

CourseCode	CourseTitle	L	T	P	C
20111AEC41	AdvancedEnglish-IV	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- Tofamiliarizewiththeobjectivesandtypesofinterview
- Toknowthetypesofquestionsand answeringtechniques
- Topreparereviewsandproposals
- Tolearnthegrammatical forms
- Tounderstand themeaningof apoemandwritethecontent
- Towriteforand againstatopic
- Todrawaflowchart
- Towritedefinitions

Outcome:

- Developwritingskill
- Comprehendanddescribepoems
- Learninterviewingskills

UNIT -I

Interviews

Objectives,types,tensuccessfactors,tenfailurefactors-Planningandpreparation-Presentation-Typeof questions- Answeringtechniques.

UNIT - II

Flowchart,Proposals

UNIT - III

Discoursemarkers,Review

UNITIV

Grammaticalforms,Paraphrasing

UNIT -V

Definition,Writingforand againstatopic.

REFERENCEBOOKS:

Author	Titleofthe book	Edition/ Year	Publisher
RajendraPal& J.SKorlahalli	Essentials of Business Communication	2015	SultanChand &Sons
Meenakshi Raman & SangeethaSharma	TechnicalCommunication	2011	Oxford University Press
Wren&Martin	English Grammar & Composition	2009	S.Chand

CourseCode	CourseTitle	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Course Objective:

- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Course Outcome:

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express one's views in writing

UNIT -I

My Last Duchess - Robert Browning

The Toys - Coventry Patmore

I, too - Langston Hughes

UNIT -II

How to be a Doctor - Stephen Leacock

My Visions for India - A.P.J. Abdul

Kalam Woman, not the weaker sex - M.K. Gandhi

UNIT -III

The Best Investment I ever made -

A.J. Cronin The Verger - W.S. Maugham

A Willing Slave - R.K. Narayan

UNIT -IV

Macbeth, As You Like It

UNIT -V

Henry IV, Tempest

Textbook:

Author	Title of the book	Edition/ Year	Publisher
Devaraj	English for Enrichment	2012	Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

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CourseCode	CourseTitle	L	T	P	C
20198SEC43	Auditing	3	1	1	3

AIM:

- To define the aim of your clinical audit project consider what it is that you hope to achieve

OBJECTIVES:

- The students will enable the system of internal check.
- Checking arithmetical accuracy of books of accounts, verifying posting, casting, balancing etc.

Unit-I

Auditing—Definition— Objectives—Types of Audit—Advantages —Qualities of a Professional auditor— Investigation Vs Auditing

Unit-II

Internal Check—Objectives, Principles, Advantages—Internal check system and Auditor— Internal Control—Internal Audit

Unit— III

Vouching—Objectives, Importance, - Vouching of Cash Transactions, Trading Transactions and Impersonal ledger.

Unit-IV

Verification and valuation of Assets and Liabilities—Cash— Investments Advances, Land and Building, Plant and Machinery, Furniture, Stock, Capital, Creditors, Bills Payable

Unit— V

Company Audit— Provision in the companies Act relating to auditor's qualifications, appointment, removal, Rights, duties and liabilities, (Civil and Criminal)

OUTCOMES:

- Articulate knowledge of fundamental audit concepts
- Apply critical thinking skills and solve auditing Problems.
- Apply and demonstrate the accounting knowledge and skills in Auditing.
- Explain how analytical procedures are used as an audit tool.
- Illustrate effective internal controls
- Apply ethical standards to issues in auditing

Reference Books

- B.N.Tandon— 'A Practical] Hand Book of Auditing'
- Dinkar Pagare— 'Principles and Practice of Auditing'
- R.G.Saxena— 'Principles and Practice of Auditing'
- Rupram Gupta— Auditing.

5. C.R.M.Depuala—ThePrinciplesofAuditing

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CourseCode	CourseTitle	L	T	P	C
20198SEC44	BusinessStatistics	3	1	2	4

AIM:

- Provide a foundation and motivation for exposure to statistical ideas subsequent to the course.

OBJECTIVE:

- Motivate students and instill an intrinsic interest in statistical thinking.
- Instill the belief that Statistics is important for scientific research.

UNIT-I

Meaning and scope of statistics, uses of statistics in business, statistical Data—primary and Secondary Data—classification of Data—Frequency distribution— Graphs and Diagrams.

UNIT- II

Measures of central tendency—arithmetic Mean, Mode, Median, geometric Mean and Harmonic Mean—Merits and Demerits of various Measures of Central Tendency

UNIT -III

Measures of dispersion —Range—Mean deviation, Standard deviation-Quartile Deviation

Co-Efficient of Variation—Difference between Mean Deviation and Standard Deviation- Different methods of Measuring Dispersion.

UNIT-IV

Correlation—Types of Correlation—Methods of Correlation—Co-Efficient of Correlation—Regression- Difference between correlation and regression—regression Equations.

UNIT-V

Time series — Secular trend — Graphic, Semi Average, Moving Average and Least Square Method- Index numbers—Cost of living index Numbers—index numbers of wholesale prices— Methods of Construction of index numbers.

Employability**OUTCOMES:**

- Critically evaluate the underlying assumptions of analysis tools
- Solve a range of problems using the techniques covered
- Conduct basic statistical analysis of data.
- Understand basic statistical concepts such as statistical collection, statistical series, tabular and graphical representation of data
- Calculate measures of central tendency, dispersion and asymmetry, correlation and regression analysis
- Choose a statistical method for solving practical problems

References:

1. Gupta S.P.-statistics methods.
2. Elhance D.N,-Fundamentals of statistics
3. SP.Rajagopalan & R.sattanathan-Business Statistics and Operations Research
4. PR.Vittal-Business Statistics
5. Navaneetham- Business statistics

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CourseCode	CourseTitle	L	T	P	C
20198AEC45	VisualBasicProgramming	3	0	0	4

AIM: Students must know about the Core programming of visual basic. Students will understand.

OBJECTIVE:

The ability of the system to adjust to the changing requirement of user.

The ability of the system to be able to withstand long periods of time operation by the user

UNIT I

Introduction to Visual Basic—Integrated Development Environment (IDE) features—VB editor—customizing the IDE — anatomy of a form working with form properties — setting form's properties — introducing form events and form methods.

UNIT II

Variables in Visual Basic: Declaring variables — Data types — Null values, Error value — empty value — the scope of a variable — Module level variables — Constants — Creating your own constants — Scope of a constant — Converting data types — arrays — Declaring arrays — Fixed size arrays - Dynamic arrays — Preserve keywords — ReDim. Writing Code in Visual Basic - The anatomy of a procedure — Subroutine and Functions—Language constructs-For...Next, The While loop, Select case. End select, Exit statement, with structure.

UNIT III

Selecting and Using controls—Introduction to standard controls-command buttons—Textboxes—labels —option buttons—Checkboxes-frame controls—Listboxes-Comboboxes—Image objects—Pictureboxes -Timer- Scroll Bars-File System Controls(Drive, Dirlist, FileListboxes).

UNIT IV

Introduction to Built-in ActiveX control—Toolbar—The Treeview control—The ListView control—the ImageList control—Command Dialog Control—statusbar Control—Rich text box control—Menu editor.

UNIT V

DDE properties — DDE Methods — OLE properties — Active control Creation and Usage and ActiveX DLL creation and usage — Database access — Data Control — Field control — Data grid record set using SQL to manipulate data— Open Data Base Connectivity.

OUTCOMES:

- Distinguish and compose events and methods.
- Distinguish and compose events and methods.
- Recognize and arrange control structures.
- Understand development of applications.
- Identify sources for research and further develop a strategy for research using standard and electronic research tools C
- This course will be helped the students understanding on database operations

Reference Books:

1. Mohammed Azam Programming with Visual Basic 6.0 — Vikas Publishing House Pvt. Ltd—2002.

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SEMESTER-IV

CourseCode	CourseTitle	L	T	P	C
20198AEC46L	VisualBasicProgrammingLab	0	0	3	2

AIM:

It gives practical knowledge to the students on visual Basic Programming

OBJECTIVE:

1. To know the process of visual program design and development.
2. To understand the term event-driven programming.
3. To acquire the concepts of objects, properties, and methods.

1. Simple exercises using standard controls.

2. Write a program to design a calendar of any year.

3. Write a program to expand and shrink an object—while program is running.

4. Write a code to design and implement a scientific calculator.

5. Write a program to create an animation by using move method and timer Object.

6. Write a program for preparing students mark list.

7. Write a program to populate the label entities using data bound control.

8. Write a program to expand and shrink Objects using timer control and move method

OUTCOME:

- Understand an overview of computers and computer programming.
- Understand Visual Basic applications.
- Understand how to perform operations and store results.
- Understand the concept of data-driven program execution flow control in Visual Basic programming

CourseCode	CourseTitle	L	T	P	C
201ENSTU47	EnvironmentalStudies	0	0	0	2

UNIT-I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Publicawareness-naturalResources:RenewableandNon–RenewableResources- ForestResources–WaterResources-MineralResources-FoodResources –EnergyResources– LandResources.

UNIT-II

Ecosystems- Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers anddecomposers – Energy flow in the ecosystem – Ecological succession- Food chains, food webs and ecological pyramids –Typesofecosystem–Forestecosystem– Greenlandecosystem– Desertecosystem–Aquaticecosystems.

UNIT-III

Biodiversity and its Conservation – Definition- Genetic, Species and ecosystem diversity – Bio geographicalclassification of India – Values of biodiversity – Biodiversity at global, National and local levels – India as a mega –diversity nation –Hot-spotsof biodiversity- Threats tobiodiversity –Endangeredandendemicspecies of India– Conversationofbiodiversity.

UNIT-IV

Environmental Pollution – Definition – Air Pollution – Water pollution –Soil Pollution- Marine Pollution- NoisePollution –Thermal Pollution – Nuclear hazards –Solid waste Management –Role of an individual in prevention ofpollution–Disastermanagement.

UNIT-V

Social Issues and the Environment – From Unsustainable to Sustainable development- Urban problems related toenergy –Water conservation, rain water harvesting, watershed management- Environmental Ethics – Climate changegreenhouse effect and global warming – Ozone depletion –Waste land reclamation –Consumerism and waste products –Environmental Legislation –Issues involved in enforcement of environmental legislation – Public awareness-Humanpopulationandtheenvironment.

Employability

OUTCOME:

- Mastercoreconceptsandmethodsfromecologicalandphysicalsciencesandtheirapplicationinenvironmentalproblem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design andevaluationofenvironmentalpoliciesandinstitutions.
- Appreciatetheethical,cross-cultural,andhistoricalcontextofenvironmentalissuesandthelinksbetweenhumanand natural systems.
- Understandthetransnationalcharacterofenvironmentalproblemsandways,addressingthem,includinginterac tionsacrosslocalto global scales.
- Applysystemsconceptsand methodologiestoanalyzeandunderstandinteractionsbetweensocialandenvironmentalprocesses.
- Reflectcriticallyabouttheirrolesandidentitiesascitizens, consumersandenvironmental actorsinacomplex,interconnectedworld.
- Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oralcommunicationneededtoconducthigh-levelworkasinterdisciplinyscholarsand/orpractitioners.

TEXTBOOK:

‘ENVIRONMENTALSTUDIES’,K.Kumarasamy,A.AlagappaMoses,M.vasanthi

SEMESTER IV

CourseCode	CourseTitle	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course is to cultivate and nurture the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torchbearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence, and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach to leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Model of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Teamwork
- Negotiation

- Networking

UNITII-ManagerialSkills

a. BasicManagerialSkills

- Planningforeffectivemanagement
- Howtoorganiseteams?
- Recruitingandretainingtalent
- Delegationoftasks
- Learntocoordinate
- Conflictmanagement

b. SelfManagementSkills

- Understandingselfconcept
- Developingself-awareness
- Self-examination
- Self-regulation

UNITIII-EntrepreneurialSkills

a. BasicsofEntrepreneurship

- Meaningofentrepreneurship
- Classificationandtypesofentrepreneurship
- Traitsandcompetenciesofentrepreneur

b. CreatingBusinessPlan

- Problemidentificationandideageneration
- Ideavalidation
- Pitchmaking

UNITIV-InnovativeLeadershipandDesignThinking

a. InnovativeLeadership

- Conceptofemotionalandsocialintelligence
- Synthesisofhumanand artificialintelligence
- Whydoes culturematter fortoday'sgloballeaders

b. DesignThinking

- Whatisdesignthinking?
- Keyelements of designthinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution
- Howtotransformchallengesintoopportunities?
- Howto develophuman-centricsolutions forcreating socialgood?

UNITV-EthicsandIntegrity

a. LearningthroughBiographies

- Whatmakesanindividualgreat?
- Understandingthepersonaofaleader forderivingholisticinspiration
- Drawinginsightsforleadership
- Howleaderssailthroughdifficultsituations?

b. EthicsandConduct

- Importanceofethics
- Ethicaldecisionmaking
- Personalandprofessionalmoralcodesofconduct
- Creatingaharmoniouslife

Bibliography and Suggested Readings:

Books

- Ashokan, M.S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. HarperBusiness
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with Cultural Intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes from a Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. HarperCollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam -
"A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6):60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC51	CorporateAccounting	4	1	1	5

AIM

Thecoursecoversthebasicaccountingpracticesofcorporatebusinesses.

OBJECTIVES

- I. Tounderstandthe accountingsideofsharesdebenturesand bonesshares.
- II. Toascertainthenetprofitof thecorporatebusinesssthroughfinalaccounts.
- III. Tocomputevaluationof goodwillandsharesof corporatebusinesses.
- IV. Tocarryoutthevariousstrategiesofthe corporatebusinessesintheformofmerger,reorganizationand liquidation.

UNIT – I

Issueandforfeitureofshares–RedemptionofPreferenceshares.

UNIT – II

IssueofDebentures–Redemptionofdebentures – Profitspriorito Incorporation.

UNIT – III

Finalaccountsofcorporatebusinesses –Divisibleprofitanddividends –bonesshares.

UNIT -IV

Valuationof goodwillandshares –HoldingCompany.

UNIT–V

AlterationofsharecapitalandinternalReconstruction-AmalgamationandExternalReconstruction.

Employability

OUTCOME:

- Findout how acompanycan dissolve.
- UnderstandMutualfunds’investments.
- Learn aboutworkingformatofcompanies.
- EnablingthestudentstounderstandthefeaturesofSharesandDebentures
- Developanunderstandingabout redemptionof SharesandDebentureanditstype
- Exposuretothecompanyfinalaccount

REFERENCEBOOKS

1. M.C.ShuklaandT.S.Grewal –AdvancedAccounts.
2. R.L.Gupta–AdvancedAccountancyVol.–II.
3. JainandNarang–Advanced AccountancyVol.–II.
4. S.P.Iyengar–Advanced AccountancyVol.– II.
5. Dr.R.Ramachandarnand Dr.R.Srinivasan–CorporateAccounting

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC52	BusinessEconomics	3	1	1	4

AIM:

- Students will learn how markets and other governance structures organize core economic activities.

OBJECTIVE:

- Identify and explain economic concepts and theories related to the behavior of economic agents, markets, industry and firm structures, legal institutions, social norms, and government policies.
- Integrate theoretical knowledge with quantitative and qualitative evidence in order to explain past economic events and to formulate predictions on future ones.

Unit-I

Definition—Methods of Economics —Meaning of Business Economics —Objectives of Business Economics —Nature of Business Economics—Economic Laws—Micro—Macro Economics.

Unit—II

Demand Analysis—Demand Schedule—Law of Demand—Demand Curves—Elasticity of Demand—Indifference Curves.

Unit—III

Production Function—Factors of Production—Laws of Return—Cost of Production—curve—Scale of Production—Isoquant curve—Economies of Large scale production.

Unit-IV

Cost concepts-Different costs-Long and short run cost curves—Relationship between costs—Breakeven analysis

Unit-V

Market Structure—Firm—Equilibrium Firm and Industry—Optimum Firm—Pricing—Pricing under Perfect competition—Monopoly— Duopoly- Oligopoly

Employability**OUTCOME:**

- Apply the concept of opportunity cost.
- Understand the concepts of cost, nature of production and its relationship to Business operations.
- Apply Economic theories to business decision
- Use the theoretical concept of demand and supply analysis in practice
- Understand the cost concepts, theories of profit and business cycles
- Use different demand forecasting techniques and apply different pricing techniques in business
- Understand the importance of Fiscal policy

Reference Books:

1. K.P.M. Sundaram & EN.Sundaram-Business Economics
2. S., Sankaran -Business Economics
3. PN.Reddy & Appanaiyah—Business Economic

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COURSECODE	COURSE TITLE	L	T	P	C
2019SEC53	Financial Management	3	1	1	4

AIM:

Optimum funds utilization. Once the funds are procured, they should be utilized in maximum possible way at least cost.

OBJECTIVE:

- To ensure regular and adequate supply of funds to the concern.
- To ensure adequate return to the shareholders which will depend upon the earning capacity, market price of the share, expectations of the shareholders

Unit — I

Introduction—Finance and related disciplines—Scope of financial management—Objectives of financial management—Financial Decisions - Organization of finance function

Unit-II

Cost of capital—cost of debt—cost of preference shares—cost of equity—cost of retained earnings—weighted average cost of capital.

Unit-III

Introduction—Capital structure—Determinants-Theories~Net income approach—Net operating income approach—M.M. Approach—Traditional approach

skill development

Unit—IV

Leverage—Meaning and types—Significance—Operating leverage—Financial leverage-Combined leverage

Unit— V

Dividend policy—Factors influencing dividend policy—Theories-Relationship with value of firms—Stock dividend—Stock splits

OUTCOME:

- Use business finance terms and concepts when communicating.
- Demonstrate basic understanding of financial management.
- Provide introduction to Financial Management
- Create an awareness about capital structure and theories of capital structure
- Make them understand the cost of capital in wide aspects
- Provide knowledge about dividend policies and various dividend models.
- Enable them to understand working capital management

Reference Books

1. Kulkarni-Financial Management
2. S.N.Maheswari -Financial Management
3. R.K.Sharma-Financial Management
4. Prasanna Chandra - Fundamentals of Financial Management
5. R.Ramachandran, R.Srinivasan —

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC54	SoftwareEngineering	3	1	1	4

AIM:

- To produce programmer equipped with an understanding of fundamental computational concepts underlying most programming languages

OBJECTIVE: Students to know about:

- Techniques for solving problems
- Basic computational concepts and elementary data structures
- The edit-compile-link-run cycle from a user point of view

UNIT I

Introduction — definition-size factors- quality and productivity factors- managerial issues. Planning - software project — introduction — defining the problem - developing a strategy - planning the development process-planning an organizational structure.

UNIT II

Software cost estimation — cost factors — cost estimation techniques — staffing — level estimation — estimating software maintenance costs. Software requirements definition — software requirements specification techniques — languages and processors for requirements.

UNIT III

Software design — fundamental design concepts — modules and modulation criteria — design notations — design techniques — detail design considerations — real time and distributed system design — test plans — milestones walk-throughs and inspections — design guidelines.

UNIT-IV

Implementation issues — structured coding techniques — coding style — standards and guidelines — documentation guidelines — data abstraction — exception handling — concurrency mechanisms.

UNIT V**Entrepreneurship**

Verification and validation techniques — quality assurance — walk-through and inspections — static analysis — symbolic execution — unit testing and debugging — system testing — formal verification. Software maintenance — enhancing maintainability during development — managerial aspects — configuration management — source code metrics.

OUTCOMES:

- To identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- To apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- Analyze the importance of management information system and networking in a business.
- Be aware and perform various activities using computers in day-to-day life.

Text Book

Software Engineering Concepts — Richard Fairly TMH

Reference Book: 1. "Software Engineering" - Roger S. Pressman, 5th edition 2001.

COURSE CODE	COURSE TITLE	L	T	P	C
20198DSC55A	Elective-IA-Management Information System	3	0	1	2

AIMS:

The overall aim of this course is to provide students with an understanding of how to use and manage information systems in order to revitalize business processes, improve business decision making, and gain competitive advantage.

OBJECTIVES:

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students to understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
- To provide the theoretical models used in database management systems to answer business questions.

UNIT I

The meaning and use of MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning, Organizing and Controlling MIS.

UNIT II

Planning, Implementation and Controlling of Management Information System.

UNIT III

Fundamentals of Data Processing, Computer Operation of Manual Information System, Components of Computer Systems, Flow Chart, Conversion of Manual to Computer Based Systems, Computer Systems Software, Application Software, Telecommunication Modem

UNIT IV

Managerial Decision Making, characteristics and components of Decision Support System.

UNIT V

System Design: System design consideration, input/output design, forms design, file organization and database, data management, file design, program design, control and security.

OUTCOME:

- Relate the basic concepts and technologies used in the field of management information systems;
- Compare the processes of developing and implementing information systems.
- Outline the role of the ethical, social, and security issues of information systems.
- Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
- Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

REFERENCEBOOKS

1. Jawadekar, W.S., "Management Information Systems", Tata McGraw Hill Private Limited, New Delhi, 2009.
2. Kenneth C. Laudon and Jane P. Laudon: "Management Information Systems" 9/e, Pearson Education, New Delhi.
3. Alex Leon and Mathew Leon: "Data Base Management Systems", Vikas Publishing House, New Delhi.
4. Goyal, D.P.: "Management Information System", MACMILLAN India Limited, New Delhi, 2008.
5. Mahadeo Jaiswal, Monika Mital: "Management Information System", Oxford University Press, New Delhi, 2008.
6. Murthy C.S.V.: "Management Information System", Himalaya Publications, New Delhi, 2008.
7. Panneerselvam R.: "Database Management System", PHI Private Limited, New Delhi, 2008.
8. Philip J, Pratt, Joseph J. Adamski: "Database Management Systems", Cengage Learning, New Delhi, 2009.
9. Richard T. Watson: "Data Management", WILEY INDIA Limited, New Delhi, 2008.
10. Roband Cornell: "Data Base Management Systems" Cengage Learning, New Delhi.

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COURSECODE	COURSE TITLE	L	T	P	C
20198DSC55B	Elective-IB-StockMarket Price	3	0	1	2

AIM:

The aim of the course is to provide practical exposure to the students on the functioning of the stock market and on the stock market practices like trading mechanism, clearing and settlement, demat trading.

OBJECTIVES

- I. To provide an introduction to the financial markets and to analyze the role of financial markets for the broader macro.
- II. The course will help them in building a career in stock market/broking houses.
- III. To help them to understand the practical aspects of primary and secondary market operations.

UNIT I

Trading Mechanism in Stock Exchanges: Introduction- Market Types- Market Phases- Invoking an Inquiry Screen- Order Management- Trade Management- Auction- Limited Physical Market- Retail Debt Market- Internet Broking- Wireless Application Protocol. Legal framework of Securities Market: SEBI Guidelines Relating to the Functioning of Stock Exchanges and Intermediaries; SEBI and Investor Protection; Securities Contract Regulation Act and Listing of Securities; Regulations and Guidelines for FIIs.

UNIT II

Clearing and Settlement Process: Introduction- Transaction cycle- Settlement Process- Settlement Agencies- Risks in Settlement- Settlement Cycle- Securities Settlement- Funds Settlement- Shortages Handling- Risk Containment Measures- International Securities Identification Number- Clearing Software- Reports- File Transfer Protocol.

UNIT III

Trading pattern in BSE and NSE: Security Market Indicators- Need and Importance; BSE Sensex, NSE, NIFTY and other Index Numbers.

UNIT IV

Demat Trading: Meaning and Significance; Role of Depositories and Custodian of Securities in Demat Trading; SEBI Guidelines and other Regulations relating to Demat Trading; Procedure of Demat Trading- Introduction to Online- Trading.

UNIT V

Derivatives Trading: Approving for derivative trading, Derivatives market at NSE, Trading mechanism, membership criteria, Turn over, Clearing and settlement, Risk Management system.

OUTCOMES:

- Understand the trading mechanism in stock exchange.
- Understand the trading pattern in BSE and NSE.
- Get knowledge on the Demat Trading.
- Discuss on the SEBI guidelines and other regulations relating to Demat Trading.
- Get through the certification examinations conducted by BSE and NSE, and
- Start stock trading concern and become a successful Financial Entrepreneur.

- Pedagogical Methods Adopted: Flipped Learning, Blended Learning, Experiential Learning,
- Participative Learning, Case Study Method and Problem Based Learning

REFERENCE BOOKS:

1. Ashwani Gujral, 2018, How to Make Money in Intraday Trading, Vision Books Pvt. Limited, New Delhi.
2. Avadhani V. A. 1997, Indian Capital Market, (1st Ed.), Himalaya Publishing House.
3. Tadashi Endo, 1998, The Indian Securities Market A Guide for Foreign & Domestic Investors, (1st Ed.), Vision Books.
4. Amit Bhargava, 2003, Guide to SEBI (Disclosure & Investor Protection) Guidelines, Taxmann Publications.
5. Gurusamy S., 2004, Financial Markets & Institutions, (1st Ed.), Thomson Books.
6. Dave, 2007, Securities Markets & Products, (2nd Ed.), Taxmann Publications.
7. Keith Dickinson, 2015, Financial Markets Operations Management, John Wiley & Sons.

ONLINE REFERENCE:

1. MOOC Material: Finance for Everyone: Values, Created by: McMaster University, Delivered by: Coursera, Taught by: Arshad Ahamed.
2. MOOC Material: Behavioral Finance, Created by: Duke University, Delivered by: Coursera, Taught by: Emma Rasiel.
3. MOOC Material: Behavioral Finance (Coursera), Created by: Duke University, Delivered by: Coursera, Taught by: Emma Rasiel.
4. MOOC Material: Portfolio and Risk Management (Coursera), Created by: Indian School of Business (ISB), Delivered by: Coursera, Taught by: Ramabhadran Thirumalai.

SEMESTER V
COMMUNICATIONS SKILLS

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Course Objectives:

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare a good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual's SWOT.

Course Outcomes:

At the end of this course, the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture self-interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

Resume Skills: Preparation and Presentation

- Introduction of resume and its importance
- Difference between a CV, Resume and Biodata
- Essential components of a good resume

ii. Resume skills: common errors

- Common errors people generally make in preparing their resume
- Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

i. Interview Skills: Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

ii. Interview Skills: Simulation

- Observation of exemplary interviews

- Commentcriticallyonsimulatedinterviews

iii. *InterviewSkills:CommonErrors*

- Discussthecommonerrorsgenerallycandidatesmakeininterview
- Demonstrateanidealinterview

UnitIII:GroupDiscussionSkills

MeaningandmethodsofGroupDiscussion

- ProcedureofGroupDiscussion
- GroupDiscussion-Simulation
- GroupDiscussion-CommonErrors

Unit IV:ExploringCareer

OpportunitiesKnowingyourself–

personalcharacteristics

- Knowledgeaboutthe worldofwork,requirementssofjobsincludingself-employment.
- Sourcesofcareerinformation
- Preparingfor acareer based ontheirpotentials and availabilityofopportunities

Skill/Employability

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC61	Management Accounting	3	1	2	5

AIM

- To emphasize the importance of accounting information for managerial decision making and solving problems.

OBJECTIVES

- vii. To gain expert knowledge of the techniques of managerial accounting.
- viii. To know the application of various financial tools for making managerial decisions.
- ix. To apply techniques of costing for business decisions.

Unit-I

Definition of Management accounting—
 Nature, scope, objectives, Functions of management accounting—
 Management Accounting and Financial Accounting Management Accounting and Cost Accounting —
 Advantages & Limitations of Management Accounting

Unit-II

Financial Statement Analysis-Comparative statement—Common Size statement—Trend percentages —
 Ratio Analysis.

Unit-III

Fund Flow Analysis and Cash Flow Analysis

Unit-IV

Marginal costing and Break—Even analysis—Budget and budgetary controls—Classification of budgets

Unit— V

Standard costing and variance analysis, Capital budgeting-Importance—Techniques of capital budgeting

skill development

OUTCOMES:

- Prepare analysis of various special decisions, using relevant costing and benefits
- More effective planning and control systems
- The students thought and knowledge on management Accounting
- Help to give proper idea on financial statement analysis in practical point of view
- Introduce the concept of fund flow and cash flow statement
- Provide knowledge about budget control keeping in mind the scope of the concept
- Develop the know-how and concept of marginal costing with practical problems

1. ShashiK.Gupta&R.K.Sharma -Management Accounting
2. S:N.Maheswari-ManagementAccounting
3. R.Ramachandran andR.Srinivasan —ManagementAccounting
4. HingoraniandRamanathan —ManagementAccounting

COURSECODE	COURSE TITLE	L	T	P	C
20198SEC62	Income Tax Law and Practice	3	1	1	5

AIM:

To understand the basic elements of income tax theory, law and practice.

OBJECTIVES:

- I. To learn the basic concepts in income tax law
- II. To identify the various sources of income
- III. To know tax exemption and deductions.

Unit—I

Basic Concepts — Definitions — Assesses — Person, income, assessment year, previous year, basis of charge: Determination of Residential Status — Income exempt from tax

Unit-II

Salary: Definition — Salary under section 17 — allowances, perquisites, profit in lieu of salary — deductions under section 16 — computation of salary income.

Unit—III

House property: Definition, exempted incomes from house property — Annual value — determination of annual value — Let out — Self occupied — Deductions — computation of property income.

Unit—IV

Profits and Gains of business or profession — definition — charging provisions — deductions — computation of business and professional income

Unit— V

Capital Gains: Basis of charge — Cost of acquisition, cost of improvement — exempted capital gain — computation of capital gain — Income from other sources — Chargeability — deductions — Computation of Income under other sources.

OUTCOMES:

- File IT Return on individual basis
- Compute the total Income and define tax complications and structure.
- In order to familiarize the different know-how and heads of income with its components
- It helps to build an idea about income from house property as a concept
- It gives more idea about the income from business or profession
- Make the students familiarize with the concept of depreciation and its provisions

Reference Books:

1. Gaur and Narang - Income Tax Law and Practice

2. Jayakumar and Dr. Hariharan - Income Tax Law and Practice
3. Rajavelu — Income Tax Law & Practice
4. Bagawathi Prasad — Income Tax

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COURSECODE	COURSE TITLE	L	T	P	C
20198SEC63	Database Management Systems	3	1	1	4

AIM

The primary goal of a **DBMS** is to provide an environment that is both convenient and efficient to use in retrieving and storing database information.

OBJECTIVES

- I. To understand what a database is, about different types of databases, and why they are valuable assets for decision making.
- II. To appreciate the importance of database design.
- III. How and why modern databases evolved from files and file systems.

UNIT-I:

Concepts of DBMS, advantages, various views of data, data independence, schema and Sub-schema, data models, database languages, database administration & Users.

UNIT-II:

Data dictionary, overall system architecture, E-R models, mapping constraints, Keys: Primary, Candidate, Super Key, Foreign Key.

UNIT-III:

Access Concepts & terms: database tables, relational database, record, fields controls & objects, queries and dynasets.

UNIT-IV:

Forms, reports, properties, wizards, macros, Access requirements, starting & quitting access, the access workspace & tool views.

UNIT-V:

Creating database & tables with & without wizard, field name, data types and properties, adding & deleting fields in fields.

OUTCOME:

- Understand database concepts and structures and query language
- Understand the ER model and relational model
- Understand Functional Dependency and Functional Decomposition.
- Apply various Normalization techniques
- Understand query processing and techniques involved in query optimization.
- Understand the principles of storage structure and recovery management.
- Understand database concept and structures and query language.

References:

1. Working in MS-Office—“Ron Mansfield”(TMH)
2. Complete Reference Access 2002-Virginia Anderson(TMH)
3. Database-Management System—Silberchatz, Korth

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COURSECODE	COURSE TITLE	L	T	P	C
20198DSC64A	Elective- IA-E-Commerce	3	0	2	2

AIM:

To reach out to a larger audience since Internet access is becoming a mainstream.

OBJECTIVES

- I. This course provides an introduction to information systems for business and management.
- II. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems

Unit I:

E-Commerce and E-Business – Introduction – technological Advancements – E-commerce defined – E-commerce

Unit II:

Business Models for E-Commerce –
E-Business Models Based on the relationship of Transaction parties – B2c – Business to Business – Customer to Customer – Consumer to – Business

Unit III:

E-Marketing – Traditional Marketing – Meeting the needs of Website visitors –
E-Marketing value chain – Maintain website – Online Marketing

UNIT IV

e-Payment Systems: Main Concerns in Internet Banking – Digital Payment Requirements –
– Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and Payment Systems –
Designing payment Systems – Online Financial Services in India – Online Stock Trading.

UNIT V

Information systems for Mobile Commerce: What is Mobile Commerce? – Wireless Applications –
Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies –
Different Generations in Wireless Communication

OUTCOMES:

- Demonstrate an understanding of the foundations and importance of E-commerce
- Analyze the impact of E-commerce on business models and strategy
- Describe the infrastructure for E-commerce
- Discuss legal issues and privacy in E-Commerce
- Assess electronic payment systems

TEXTBOOK

1.P.T.Joseph,S.J.,“E-Commerce-An Indian Perspective”,4Edition,PHI2012.

REFERENCEBOOK

David Whiteley,“E-Commerce Strategy, Technologies and Applications”,TataMc-Graw-Hill, 2001

SEMESTER-VI
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COURSECODE	COURSE TITLE	L	T	P	C
20198DSC64B	Elective–IB–WebDesigning	3	0	1	2

Objectives:

This Subject is useful for Making own Webpage and how to host own website on internet. Along with that Students will also learn about the protocols involved in internet technology.

UNIT I

Introduction to WWW : Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP Web Design: Website design principles, planning the site and navigation,

UNIT II

Introduction to HTML : The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Metatags, Character entities, frames and framesets, inside browser.

UNIT III

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2. Javascript : Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition

UNIT IV

XML : Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application. XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

UNIT V

PHP : Starting to script on server side, Arrays, function and forms, advance PHP Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting

database, deleting data and tables, PHP myadmin and database bugs.

LearningOutcome:

After Studying that subject students would have capability to make own web site and host their ownweb site on internet. Also students would have enough knowledge about what are the technologiesusedin internet.

ReferenceBooks:

1. StevenHolzner, "HTMLBlackBook",Dremtechpress.
2. WebTechnologies,BlackBook,DreamtechPress
3. WebApplications: Conceptsand RealWorldDesign, Knuckles,Wiley-India
4. InternetandWorldWideWebHowtoprogram,P.J.Deitel&H.M.DeitelPearson.

SEMESTER VI

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Aim:

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom among students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

Course Outcomes:

After completing this course, students will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and the bonds of mutuality with the local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I-Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

UNIT II-Understanding rural economy & livelihood

Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati Raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

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M
OpenElective-Journalism

COURSECODE	COURSETITLE	L	T	P	C
201ENOECC	OpenElective -Journalism	4	0	0	2

Aim:

- Toacquaintwiththe basicknowledgeofjournalism

Objective:

- Toinstilin theminds ofstudentsthedifferentaspects ofjournalism
- Tounderstandthe differentkinds ofnews
- Tolearn thequalities andduties ofareporter,editor andsub-editor
- Tofamiliarizewiththestyle andfeaturesofthedifferentsectionsinanewspaper

Outcome:

- Becomeajournalist
- Exploredifferent kindsofnews

UNIT-I

Journalism –Definition,Qualitiesofajournalist,Formsofjournalism,Roleandelements

UNIT-II

News–Definition,Kinds,Elements,Sources

UNIT-III

Reporters

UNIT-IV

TheEditor and the Sub-editor

UNIT –V

LanguageofJournalism,StyleQ

ualitiesof aWriter

WritingaNewsstory,OpinionPieces,Reviews,Headlines,Editorials

ReferenceBook:-

Author	Titleofthe book	Edition/ Year	Publisher
Susan	Journalism		
JohnHogenberg	ProfessionalJournalism	2012	
M.JamesNeal	NewsWritingand Reporting		Surjeet Publication
M.VKomath	TheJournalist’sHandbook		

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M

Open Elective: Development of Mathematical Skills

COURSE CODE	COURSE TITLE	L	T	P	C
201MAOEC	Open Elective: Development of Mathematical Skills	4	0	0	2

Objectives

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.

To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III Set theory –

Series **Unit IV**

Matrices – Determinants

Unit V

Assignment problems

References

1. P.A. Navanitham, Business Mathematics & Statistics
2. Kantiswarup, P.K. Gupta and Manmohan, "Operations Research"

- Learning outcomes
- By the end of this course, you should be able to
- know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, statistics, Matrices and Business mathematics)
- use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

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M
Open Elective: Instrumentation

COURSE CODE	COURSE TITLE	L	T	P	C
201PHOEC	Open Elective: Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.

UNIT –I: INTRODUCTION

Potentiometer- calibration of voltmeter and ammeter, measurement of resistance, Principles of network theorems- Thevenin's and Norton's theorem- Bridges : AC bridges- Maxwell, Owen, Schering and De Sauty's bridges- Wien bridges.

UNIT –II: ELECTRONIC INSTRUMENTS –I

Basic characteristics of instruments- resolution- sensitivity- Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter- resistance meter- Amplified D.C. meter- Chopper stabilized amplifier - A.C. Voltmeter using rectifiers- Electronic multimeter- Differential voltmeter- Digital voltmeters- Component measuring instruments (quantitative studies)

UNIT –III: ELECTRONIC INSTRUMENTS –II

Signal conditioning systems- DC and AC carrier systems - Instrumentation amplifiers- Vibrating capacitor amplifier- Analog to digital data and sampling- A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity- Recording requirements- Analog recorders- Graphic recorders- strip chart recorders - Galvanometer types recorders- Null type recorders.

Unit V – CRO

CRO- Construction and action- Beam transit time and frequency limitations- Measurement of potential, current, resistance, phase and frequency- Special purpose oscilloscopes- Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick –

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K.Sawhney–Dhanpat Rai and Sons– 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

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COURSECODE	COURSE TITLE	L	T	P	C
201MBOEC	Open Elective: Wild Life Conservation	4	0	0	2

Aim:

To enable the students understand the need of conservation of wildlife in India.

Objectives:

- Maintenance of rare species in protected areas such as national parks, sanctuaries etc., Establishment of specific biosphere reserves for endangered plants and animals.
- Protection of wildlife through legislations such as banning hunting etc.,
- Imposing specific restrictions on export of endangered plants and animals or their products.

Course Outcome:

- Protection of natural habitats of organisms through controlled exploitation.
- Educating the public about the need to protect the environment
- Long range goal for preserve the wildlife for welfare of future generations
- Conservation and Maintenance of endangered plants in wildlife

Unit I:

Wildlife Management: Basic concepts and principles- Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA –

Evaluation of Wildlife habitat: Define habitat – Forest habitat types - basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect – Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species.

Unit II:

Introduction to conservation biology, the origin of conservation biology, ethical and economical values of conservation biology, definition of biodiversity, types of biodiversity, threats to biodiversity. Scopes and importance of conservation methods – *In-situ* and *Ex-situ* conservation approaches of Indian animals. Captive breeding (Lion-tailed macaque, white tiger and vultures) and reintroduction (Tiger, rhinoceros, gaur).

Unit III:

Biodiversity: Definition and importance - Biodiversity hotspots in India: Western Ghats, Eastern Himalayas. Mega diversity nations – an introduction. Landscape approach and people participation in biodiversity conservation.

Unit IV:

Role of Government and Non-Government organizations in conservation. – **Government** - Wildlife Institute of India, Ministry of Environment and Forests (MoEF), National Biodiversity

Authority (NBA), Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Salim Ali Centre for Ornithology and Natural History (SACON), Centre for Ecological Sciences (CES). NGOs – Bombay Natural History Society (BNHS), World Wide Fund for Nature (WWF), Wildlife Trust of India (WTI), Nilgiri Wildlife and Environment Association (NWEA), Wildlife Conservation Society (WCS).

Unit V:

Conservation Biology Tools - Biological Parks, Zoological Parks, Forest Research Institute, Agricultural Research Institutions, Gene Pools, Cryopreservation Centres, Interpretation Centres and role of Field Biologists.

References:

1. Anon, 1992. Conservation of biological diversity. Text and annexure – WWF-India.
2. Gaughley, G. and A. Gunn. 1995. Conservation Biology in Theory and Practice. Blackwell Publishers.
3. Dobson, A. P. 1996. Conservation and biodiversity. Scientific American Library, New York, USA.
4. John M. Fryxell, Anthony R. E. Sinclair and Graeme Caughley. 2014. Wildlife Ecology, Conservation and Management. 3rd Ed. Wiley Blackwell IP

COURSECODE	COURSE TITLE	L	T	P	C
201CAOEC	Open Elective–E- Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop –learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding e-learning, components and models of e- learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, -Applications of E-learning.

UNIT II CONCEPTS AND DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assurance-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self-managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

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A**

COURSECODE	COURSE TITLE	L	T	P	C
201CSOEC	Open Elective-Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice markup languages
- To learn Style Sheet and Frames

UNIT I

Introduction to the Internet: networking-internet-email-

Internet Technologies: modem internet addressing.

UNIT II

Internet browsers: Internet Explorer-Netscape navigator-

Introduction to HTML: Html document- anchor tag-hyperlink.

UNIT III

Head and body sections: Header section-titles-links-colorful webpage-

sample html document - Designing the body section: paragraph - tab setting.

UNIT IV

Ordered and unordered lists: list-unordered list-heading in a list-order list-nested list.

UNIT V

Table handling: tables-table creation in html cell spanning multiple rows and columns-

coloring cells-sample tables-frames frameset definition-nested frames set.

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design frontend webpage and connect to the backend databases.

REFERENCE BOOKS

1. World Wide Web design with HTML- C.Xavier - Tata McGraw-Hill-2000.
2. Principles of web design-Joel Sklar-Vikas publishing house 2001.

COURSECODE	COURSE TITLE	L	T	P	C
201TERP9	TALLY ERP 9	-	-	-	3

AIM

To develop the knowledge regarding the concepts of financial accounting in students that is used for learning to maintain accounts.

OBJECTIVES

To impart practical knowledge in TALLY and ensures that finance for the company is always in order and is correct at all given points of time.

UNIT – I

TALLY – Introduction to Tally Prime –Difference between Tally Prime and Tally ERP 9 – New Features in Tally Prime

UNIT – II

Company Creation – Chart of Accounts

UNIT – III

Inventory Master and Inventory Vouchers in Tally

UNIT – IV

Payroll Master in Tally

UNIT –V

Reports in Tally

OUTCOME

Students are able to get placements in different offices as well as companies in Accounts departments.

REFERENCE BOOKS

1. Learn Tally Prime – Gaurav Agarwal

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RESEARCH INTEGRATED CURRICULUM

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student; both have their justification in the service of scholarship. For the students who are the professional of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyze their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research –Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student’s knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and inquiry mode (i.e. the students become producers of knowledge not just consumers).

The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as, Level

1: Prescribed Research

Level 2: Bounded

Research Level 3: Scaffold

Research Level 4: Self-actuated R

research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B.Com curriculum, the following Research Skill Based Courses are introduced in the B.Com curriculum.

Semester	RSB Courses	Credits
II	Research Led Seminar	1
III	Research Methodology	3
V	Participation in Bounded Research	2
VI	Project Work	4

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:** **40 Marks**
 - Seminar Report (UG)/Concept Note (PG) : 5 X 4 = 20 Marks
 - Seminar Review Presentation : 10 Marks
 - Literature Survey : 10 Marks
- **Semester Examination :** **60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Research Methodology

Courses Continuous Internal Assessment: **20 Marks**

- Research Tools (Lab): 10 Marks
- Tutorial: 10 Marks

Model Paper Writing: **40 Marks**

- Abstract: 5 Marks
- Introduction: 10 Marks
- Discussion: 10 Marks
- Review of Literature: 5 Marks
- Presentation: 10 Marks

Semester Examination: **40 Marks**

Total: **100 Marks**



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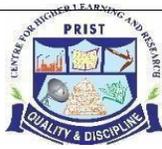
M.COM PROGRAMME

Regulation 2020

Commerce is a professional course among the various arts subjects. Commerce is instrumental in bringing about changes in all aspects of the society. It promotes growth and development. The changes in the economic policies of the country and the computer application in business offer variety of opportunities for innovative and creative people to carry out their career with new vigor and enthusiasm.

In the present scenario the market based system has gradually expanded across the world securing a strong position in the market overcoming all borders and barriers.

The rapid changes in the field of economics, information technology, politics and also in the organizational structure and the increased complexities of the business world poses series of problems to the modern commerce student. At this backdrop the new syllabus is designed for the M.Com Programme of the **PRIST UNIVERSITY**



SCHOOL OF COMMERCE AND BUSINESS MANAGEMENT

**DEPARTMENT OF
COMMERCE**

M.Com,- REGULATION 2020

COURSE

STRUCTURE SEMESTER-I

CourseCode	CourseTitle	L	T	P	C
SEMESTER-I					
20261SEC11	Marketing research and Consumer Behavior	6	0	0	4
20261SEC12	Human Resource management	6	0	0	4
20261SEC13	Services Marketing	5	0	0	4
20261SEC14	Advanced Cost Management	6	1	0	4
20261DSC15--	Discipline Specific Elective- I	5	0	0	4
20261RLS16	Research Led Seminar	-	-	-	1
	Total	28	1	0	21
SEMESTER-II					
20261SEC21	Quantitative Techniques For Decision Making	5	1	0	4
20261SEC22	Total Quality Management	5	0	0	4
20261SEC23	Advanced Management Accounting	5	1	0	4
20261SEC24	Securities Analysis and Portfolio Management	5	0	0	4
20261DSC25-	Discipline Specific Elective-II	5	0	0	4
20261RMC26	Research Methodology	3	0	0	2
20261BRC27	Participation in Bounded Research	-	-	-	2
	Total	28	2	0	24
SEMESTER-III					
20261SEC31	Project Planning and Control	5	1	0	5
20261SEC32	Advanced Corporate Accounting	5	2	0	5
20261SEC33	Brand Management	5	2	0	5
20261DSC34-	Discipline Specific Elective-III	5	0	0	4
202--OEC35	Open Elective	4	0	0	3
20261SRC36	Participation in Scaffold Research (Societal Project)	-	-	-	2
	Total	24	5	0	24
SEMESTER-IV					
20261SEC41	Income Tax Law and Tax Planning	5	2	0	5
20261SEC42	International Business	5	1	0	5
20261SEC43	Co-Operation in India and Abroad	5	1	0	5

20261DSC44-	Discipline Specific Elective-IV	5	0	0	4
20261PRW45	Project Work	-	-	-	6
20261PEE	Program – Exit Examination				2
	Total	20	4	0	27
	Total Credit For the Programme	-	-		96

DISCIPLINE SPECIFIC ELECTIVE COURSES

SEMESTER	COURSE TITLE
I	Strategic Management Organizational Behaviour
II	Corporate Legal Framework Retail Management
III	Indian Financial System International Marketing
IV	Customer Relationship Management International Financial Management

Open Electives

Semester	Open Elective Courses
III	a) Writing for the media b) Applicable Mathematics Techniques c) Bio-medical Instrumentation d) Green Chemistry e) Herbal Medicine f) M-Marketing

OUTCOMES:

- PO1-To acquaint a student with conventional as well as contemporary areas in the discipline of Commerce.
- PO2-To enable a student well versed in national as well as international trends.
- PO3-To enable the students for conducting business, accounting and auditing practices, role of regulatory bodies in corporate and financial sectors nature of various financial instruments.
- PO4-To provide in-depth understanding of all core areas specifically Advanced Accounting, International Accounting, Management, Security Market Operations and Business Environment, Research Methodology and Tax planning.

- PO5-Serve as a human resource needed for industry, consultancy, education, service, research, public administration, insurance and management.
- PO6-Understand financial and marketing both local and international issues and responsibilities of a business organization.

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC11	Marketing Research and Consumer Behavior	6	0	0	4

AIM

- To plan for Marketing Research and to predict the behaviour of a consumer at the marketplace.

OBJECTIVES

- I. To ascertain Marketing Research aids and their impacts.
- II. To plan for a new product pricing, marketing policy and strategy.
- III. To identify the different types of consumers and their behaviour.

UNIT-I

Introduction: Marketing research – An Introduction – Problem, discovery and formulation – Marketing research process- Scientific method – Research design – experimental design.

UNIT-II

Data Collection and Data analysis: primary data – secondary data collection – Survey method and its administration – Questionnaire design- Attitude measurement and scaling techniques - observation method- Sampling concepts – Selecting a sample – processing of collected data Tabulation of data – Data analysis and interpretation- Presentation of Research project

UNIT-III

Product Research – Advertising Research- Motivation Research- Sales control Research- Ethical issues in Marketing Research – Future of marketing Research.

UNIT-IV

Consumer Behaviour: Introduction of Consumer Behaviour – Consumer Research – Family – Women Consumers – Rural Consumers – Special Area Consumers market segmentation- Consumers needs and Motivation – Consumer Personality – Consumer Perception- the process of learning Consumer Behaviour.

Employability

UNIT-V

The nature of consumer attitudes – Models of consumer behavior – Group dynamics and consumer reference groups – Communication, Advertising and Consumer buying behavior – the family and life style marketing – Culture, Social class and consumer behavior – Consumer protection – Consumer profiling – Digital marketing

OUTCOME

- This specialization lays the necessary groundwork for an overall successful marketing strategy
- Knowledge required to understand the state of your product before approaching the market strategy
- Interpret development of marketing research
- Identify the major influences in Consumer Behaviour
- Theory of Consumer behaviour and relates it to the practice of marketing.
- Demonstrate how knowledge of consumer behaviour can be applied to marketing.

REFERENCE BOOKS

1. Marketing Research – Dr.D.D.Sharma
2. Consumer Behaviour-Dr.S.L.Gupta
3. Marketing Research and Consumer Behavior – M.S.Raju
4. Marketing Research and Consumer Behavior- Dr.Dominique Xardel
5. Consumer Behaviour – Sumitra Pal

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COURSECODE	COURSETITLE	L	T	P	C
20261SEC12	HumanResourceManagement	6	0	0	4

AIM

To consider the implications of diversity for the development and synthesis of specific Human Resource Policy area.

OBJECTIVES

- I. To identify the objectives of recruiting and selecting a diverse workforce as an important organizational goal.
- II. To adopt suitable performance appraisal methods, promotion policies etc.

UNIT-I

Meaning – Nature and scope, characteristics – Functions – Objectives of organization of Human Resource department – HRM- Revaluation and Development of HRM – Role Qualification and qualities of H.R. Manager – HRM- Human Resource Planning.

UNIT-II

Recruitment – Sources and Techniques of Recruitment- Selection , Placement and Induction – Interviews – Training – Principal Methods- Steps- Evaluation of Training Performance.

UNIT-III

Human Resource Development (HRD) – Management Development programmes – performance Appraisal – Counseling – Managerial Appraisal.

UNIT-IV

Promotion – Transfer – demotion and discipline – Compensation – Career Planning – Career Development – Absenteeism – Managing change – Resistance and Approaches to Organization change.

UNIT-V

Job Evaluation – Advantages and Problems of job evaluation – Wages and Salary Administration – Bonus – Fringe Benefits – Motivation and Motivation theories – Leadership – Morale – Communication – Job Satisfaction.

Employability

OUTCOME

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes
- Develop, implement, and evaluate employee orientation, training, and development programs.
- Understanding of the basic concepts, functions and processes of HRM
- Develop a selection and interviewing program
- Know formalize, Design and evaluate various Recruitment and Placement policies.
- Use methods of collecting job analysis information.

REFERENCE BOOKS

1. K.Davies – Personnel and Human Resource Management.
2. L.M.Prasad, C.B.Memoria – Human Resource Management.
3. P.Subbarao – Essential of Human Management and Industrial relations.
4. C.S.Venkataraman and B.K.Subtava – Personnel Management and Human Resources.
5. Dr.L.M.Prasad – Human Resource Management.

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC13	ServicesMarketing	5	0	0	4

AIM

To focus the Organizations offering social services including health centers communication organizations, educational institutions

OBJECTIVES

- I. To study the total quality management in maintaining and improving the quality of services.
- II. To know the tourism and other service marketing activities.

UNIT-I

Introduction – Reasons for growth in services sector – Role of services in an economy – distinction between goods and services – Classification of services – Marketing Management process for Service marketing.

UNIT-II

Development of service marketing mix – Components in the mix – People – Process – Physical evidence in managing demand and supply.

UNIT-III

Managing service quality – Dimensions and measurement of service quality – gap analysis – Total Quality Management – Guidelines for managing service competition – Globalization of services – Challenges to global service marketers – Typical international services Barriers to international marketing services.

UNIT-IV

Marketing of Insurance Services – Users – Benefits – Formation of marketing mix for insurance products – Tourism – Marketing mix for tourism, Hotel – Market segmentation for hotels – Marketing mix for hotels.

UNIT-V

Hospitals: Marketing of Health care- Types of Hospitals- Marketing mix for health care, Personal care: Marketing mix for personal care, Education marketing-Literacy – The concept- Marketing mix for adult, elementary, secondary and higher education.

Employability**OUTCOME**

- Focuses on services, service design, and service innovation, with the aim of developing empathy for customers and understanding the customer experience
- Strategies that support broader marketing decisions.
- Develop an understanding of the role of relationship marketing and customer service
- Demonstrate knowledge of the extended marketing mix for services.
- Exhibit the capability to work effectively within a team environment.
- Develop and justify marketing planning and Control Systems.

REFERENCE BOOKS

1. S.M.Jha – Services Marketing
2. Vasanthi Venugopal – Services Marketing
3. B. Balaji – Services Marketing Furthermore Management
4. Valarie A Zeithaml – Services Marketing
5. Dwayne D. Gremler – Services Marketing
6. Mary Jo Bitner – Services Marketing
7. Ajay Pandit – Services Marketing

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC14	Advanced Cost Management	6	1	0	4

AIM

To provide information to cost management to serve as a guide for making decisions for a better future of the business.

OBJECTIVES

- I. To use costing data for making decisions.
- II. To learn modern cost management concepts.

UNIT-I

Self-Study Unit: Cost concepts in decision making – Relevant cost – Differential cost – Incremental cost and opportunity cost – Objectives of a costing – System – Implementation of Costing system – Essentials of good costing system.

UNIT-II

Marginal costing – Distinction between Marginal Costing and Absorption Costing – Break Even Analysis – Cost – Volume – Profit analysis – Various decisions – making problems.

UNIT-III

Costing of Service Sector – Cost units – Transport Costing – Operating Cost of Cinema Houses – Hotel Operating Costing.

Employability

UNIT-IV

Standard Costing and Variance analysis.

UNIT-V

Budgetary Control – Flexible Budgets – Performance Budget – Zero based Budget.

OUTCOME

- Study of decision making and performance evaluation techniques in management accounting
- Understand decision making and performance evaluation techniques in management accounting.
- In modern competitive business environment, suitable business decision making is very crucial
- Identify relevant information for decision making purposes in order to produce financial analyses for a range of decisions such as product-mix, pricing, outsourcing and special orders.
- Use standard costs to prepare budgets for planning and control purposes.
- Understand the principles of standard costing.

REFERENCE BOOKS

1. A. Murthy & S. Gurusamy – Cost Accounting
2. Charles T. Horgrew and Geoge Foster – Cost Accounting a Managerial Emphasis

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COURSECODE	COURSETITLE	L	T	P	C
20261DSC15A	Elective-I-AstrategicManagement	5	0	0	4

AIM

To understand the importance of strategic management in modern business.

OBJECTIVES

- I. To consider corporate strategy formulation at the business level to have competitive advantages.
- II. To study situational and SWOT analysis.
- III. To focus on strategy formulation and evaluation.

UNIT-I

Business Policy and strategic management – Conceptualization – Features of Strategy – Strategy and Tactics- Corporate, Business and Functional level of Strategy.

UNIT-II

Environmental Scanning of Analysis-Features-Methods of Environmental analysis and Forecasting- External and Internal Environment – SWOT analysis.

UNIT-III

Corporate Appraisal-Process – Methods And Techniques used – Internal analysis- Comparative analysis – Corporate Capability.

UNIT-IV

Corporate Strategy formulation-Implementation-Expansion through Integration – Vertical Integration- Diversification - Mergers - Takeovers – Acquisition – Joint venture- Divestment Strategy – Liquidation Strategy.

UNIT-V

Strategy Evaluation and Control- Strategic Control – Types – Differences Between Strategic and operational control - Evaluation for Strategic and Operational Control.

Employability

OUTCOME

- The course helped the student to gain knowledge in corporate strategy formulation and SWOT analysis.
- Understand the basic concepts and principles of strategic management and analyse the internal and external environment of business
- Develop and prepare organizational strategies that will be effective for the current business environment
- Devise strategic approaches to managing a business successfully in a global context.
- Integrate and apply knowledge gained in basic courses to the formulation and implementation of strategy from holistic and multi-functional perspectives.

REFERENCE BOOKS

1. Micheal Proter-Competitive Strategy, Competitive advantage.

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COURSECODE	COURSETITLE	L	T	P	C
20261DSC15B	Elective-I-BOrganizationalBehaviour	5	0	0	4

AIM

To learn about the Individual and Group behaviour in an Organization.

OBJECTIVES

- I. To study the approaches and characteristics of Organizational Behaviour.
- II. To know the Leadership Styles and Leadership Theory.
- III. To highlight the importance of Motivation in an Organization.

UNIT-I

Introduction: Concept and meaning of OB – Nature of OB – Role of OB – Approaches to OB – Characteristics of OB.

UNIT-II

Individual Behavior – Perception – Personality – Meaning and Definition of perception – Nature of Perception – Importance of Perception – Perception Process – Stages in the Development of Personality – Nature of Personality – Group Dynamics – Types of Groups.

UNIT-III

Leadership – Meaning and Definitions – Nature and Characteristics of Leadership – Leadership Styles (or) Types of Leadership – Functions – Importance of Leadership – Successful Leadership – Leadership Theory.

UNIT-IV

Authority – Elements and Characteristics – Types of Authority – Nature of Accountability – Delegation of Authority – Elements of Delegation – Principles of Delegation – Types of Delegation – Importance of Delegation.

UNIT-V

Motivation – Meaning and Definition of motivation – Nature – Types – Importance of Motivation – Theories of Motivation – Features of Theory Z – Motivational Techniques – Limitations of MBO – Implementation of MBO – Job Enrichment.

Employability**OUTCOME**

- Examine the differences and similarities between leadership, power, and management
- Impact that a company's structure and design can have on its organizational behavior
- Impact of culture on organizational behavior
- Analyze management issues as related to organizational behavior
- Examine challenges of effective organizational communication
- Evaluate ethical issues as related to organizational behavior

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC21	Quantitative Techniques For Decisions Making	5	1	0	4

AIM

To understand Quantitative tools and their applications in business problems.

OBJECTIVES

- I. To make the student to learn the various techniques of statistics used in business for taking decisions
- II. To study theory of probability, testing of hypothesis and linear Programming

UNIT-I

Meaning of Quantitative Techniques – Role of Quantitative Techniques – Advantages and limitations of quantitative Techniques correlation analysis – Simple – partial and multiple, Regression analysis – Timeseries..

UNIT-II

Probability – Elements of probability – Theorems of probability – Theoretical distributions – Binomial – Poisson – Normal distribution.

UNIT-III

Definition of Hypothesis – Types of Hypothesis – Type I Error – Type II Error – t test – F test – ANOVA – Chi-Square test.

skill development

UNIT-IV

Transportation problem – Initial Basic feasible solutions by North West Corner rule Minimization method – Maximization method – Vogel's approximation method – Optimization test by Modi method – Assignment methods.

UNIT-V

Linear programming – Basic Concepts and notation – Linear programming formulation – Solution through graphic methods, Simplex Method (Simple problem)

OUTCOME

- Employ basic statistical methods to decision making
- Understand how to apply basic models and theories in business
- Solve management problems effectively
- Use software tools to model decision problems.
- Clearly identify another unstructured business problem and its components
- Employ effective techniques for addressing the major challenges presented
- Provide a solution to the decision process

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COURSECODE	COURSETITLE	L	T	P	C
20261SEC22	Total QualityManagement	5	0	0	4

AIM:

Continualimprovementofbusinessoperations.Itstrivestoensureallassociatedemployeeswork towardthecommongoalsofimprovingproductorservicequality,aswellasimprovingtheprocedureshatareinpla cefor production.

OBJECTIVES

1. TounderstandtheconceptofQuality
2. TounderstandtheImplicationofQualityonBusiness
3. ToImplement QualityImplementationPrograms
4. TohaveexposuretochallengesinQualityImprovementPrograms

UNIT-I

Total Quality Management (TQM): Elements – TQM in global perspective – Global bench marking – Business process reengineering – Global standards – ISO 9000 series – Environmental QS 14000- Qualitymanual–BarrierstoTQM.

UNIT-II

Total Quality Management and Leadership: Implementing TQM – Market choices – Meeting customerrequirements – Maintaining competitive advantage – Core competence and strategic alliances for ensuringquality –Qualityreview,recognitionandreward– Qualityawards:JapaneseDemingAward,USMalcolmBaldrigeNationalQualityAward&IndianGoldenPeacoc kNationalQualityAward.

UNIT-III

Quality Management Tools for Business Applications: Principles and Applications of Quality FunctionDevelopment – Failure Mode and Effect Analysis – Taguchi Techniques – Seven old QC Tools – SevenNew Management Tools – Statistical Quality Control Techniques (only Theory and no Problems) –MistakeProofing–Benchmarking –8DMethodology

skill development

UNIT-IV

Quality Imperatives for Business Improvement: Dimensions of Quality - Reliability Prediction Analysis – Total Productive Maintenance – Costs of Quality – Business Process Reengineering – Process CapabilityAnalysis–QualityAssuranceandISO9000Certification–ISO9001:2000.40

OUTCOMES:

- Given a product or a service type, the student manager will be able to enumerate and justify the dimension of product quality or service quality for the same
- Given the quality gurus (Deming/Juran/Taguchi/Crosby), the student manager will be able to justify their philosophies/contributions in Quality Management.
- Given a quality problem/ failure mode, the student manager will be able to identify causes and subcauses of the effect/problem draw and justify Ishikawa Diagram.
- For a given type of organization, the student manager will be able to enlist and justify the four levels of benchmarking and/or enlist and brief seven step benchmarking model
- The student manager will be able to differentiate between common and special cause of variation and/ or differentiate between attributes and variables and/ or construct and write formulae for control charts for variables and attributes.
- Critically appraise the organisational, communication and teamwork requirements for effective quality management

REFERENCE BOOKS:

1. Total Quality Management – Dale H. Besterfield et al - Pearson Education.
2. Quality Control and Total Quality Management – P.L. Jain - Tata McGraw Hill.
3. Total Quality Management – Poornima M. Charantimath – Pearson Education

SEMESTER-II**PRIST UNIVERSITY,
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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC23	Advanced Management Accounting	5	1	0	4

AIM

To enable the management to perform its managerial functions more effectively and efficiently.

OBJECTIVES

- I. To gain expert knowledge in respect of management accounting.
- II. To have sufficient information for taking vital managerial decisions.
- III. To help the management in planning, coordination, communicating and controlling.

UNIT-I

Nature and scope of Management Accounting- Objectives and Functions- Distinction between Financial Accounting and Management Accounting – Tools and Techniques of Management Accounting

-Merits/Uses of Management Accounting – Limitations – Functions of Management Accounting.

UNIT-II

Financial Statement Analysis – Ratio analysis – Revenue Statement and Financial Statement analysis – Preparation of Fund flow statement and Cash flow statement.

UNIT-III

Working Capital management: Meaning and Importance and Advantages- Factors determining the working capital requirement – Estimates of working capital requirement – Financing of working capital – New trends in Financing of working capital by Bank.

Employability

UNIT-IV

Marginal costing and differential cost analysis – Managerial applications of Marginal costing – Decisions involving alternative choices.

UNIT-V

Capital budgeting – Importance of capital budgeting- Factors influencing capital expenditure decisions – Different methods of Capital budgeting.

OUTCOME

- Activity based approaches to management and cost analysis
- Analysis of common costs in manufacturing and service industry
- Techniques for profit improvement, cost reduction, and value analysis
- Throughput accounting
- Target costing; cost ascertainment and pricing of products and services
- Pricing Decisions
- Budgets and Budgetary Control
- Evolution of standards, continuous improvement; keeping standards meaningful and relevant; variance analysis

REFERENCE BOOKS

1. T.S.Raddy&Dr.HariPrasadReddy–ManagementAccounting
2. Sharma &Gupta-ManagementAccounting
3. S.N.Maheswari-ManagementAccounting
4. Khan& Jain-ManagementAccounting
5. R.Ramachandran&R.Srinivasan-ManagementAccounting

**PRIST UNIVERSITY,
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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC24	Security Analysis and Portfolio Management	5	1	0	5

AIM

It aims at providing an in-depth knowledge of the theory and practice of portfolio management. Important theories, techniques, regulations and certain advancements in theory of investment will be covered with an aim of helping the participants make sound investment decisions in the context of portfolio investment.

OBJECTIVES

- I. Understand the various alternatives available for investment.
- II. Learn to measure risk and return. Find the relationship between risk and return. Value the equities and bonds.
- III. Gain knowledge of the various strategies followed by investment practitioners.

UNIT-I

Investment – Meaning- Nature and Scope – objectives – Speculation – Gambling – investment process – Financial System in India – Risk & Return – Measurement of Risk & Return - Nature-scope-Elements of Investment-Approaches to investment analysis- Securities-types-Features.

UNIT II

Investment alternatives and strategies: Financial investment - Non financial investment - Inbound and outbound investments – Sources of Investment Information - valuation of fixed income securities and variable income securities (excluding Derivatives).

UNIT III

Fundamental Analysis: Economic – Industry and company analysis – Sources of information for Analysis

Employability

UNIT IV

Technical Analysis – Types of charts – Dow Theory, Elliott wave theory, Odd-lot Theory, Breadth of Market, Relative Strength Analysis – Moving Average analysis - Efficient Market Hypothesis.

UNIT V
Portfolio analysis & Management: Portfolio risk and return – Diversification - Markowitz model – Sharp model: Single index model – CAPM – Arbitrage pricing theory.

OUTCOME

- Explored to different avenues of investment.
- Equipped with the knowledge of security analysis.
- Apply the concept of portfolio management for the better investment.
- Invest in less risk and more return securities.
- The course helped the students to develop an understanding of the changing domestic and global investment scenario in general and Indian capital market in particular with reference to availability of various financial products and operations of stock exchanges

REFERENCE BOOKS

1. Security Analysis and Portfolio Management :S.Kevin, PHI Learning Pvt Ltd, New Delhi.
2. Security Analysis and Portfolio Management:V.A.Avadhani,HimalayaPublishingHouse,Mumbai.
2. Security Analysis and Portfolio Management :PunithavathyPandian, Vikas Publishing House PvtLtd,NewDelhi.
3. InvestmentManagement:L.Natarajan,MarghamPubliction,Chennai.
4. InvestmentManagement:Bhalla, Tuteja,S.Chand&SonsPublisher,NewDelhi.

**PRIST UNIVERSITY,
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COURSECODE	COURSETITLE	L	T	P	C
21261DSC25A	Elective-II–A-CorporateLegalFrameWork	5	0	0	4

AIM

To understand the fundamental principles of legal and regulatory framework of corporate business.

OBJECTIVES

- I. To familiarize the students to understand the provisions of corporate laws.
- II. To study the problems involving issues in corporate laws.
- III. To know the implications of other relevant laws in the corporate management.

UNIT-I

Company; Definition – kinds of companies – Lifting of corporate veil – Pre- Incorporation – Memorandum of Association – Incorporation of a company – Legal Position of a Promoters.

UNIT-II

Membership of companies – Definition – Meeting of the Board of Directors – Kinds of meeting – Quorum – powers of the Chairman – Duties of the chairman – Minutes of meeting.

UNIT-III

Environmental legislation - legal and regulatory frame work – Procedures for obtaining various Environment clearances – functions of Environment Tribunal – Environment Authority – Environment Audit.

UNIT-IV

Consumer Protection Act - Genesis of the law – Objects of consumer protection – Definition – Rights of consumer protection Act- Nature and Scope of Remedies – Indemnity and Guarantee – Bailment and pledge.

UNIT-V

Insurance Act, 1938 – Insurance Regulatory & Development Act, 1999 – Insurance sector Reforms – IRDA (Investment) Regulations 2000 – IRDA Guidelines for Insurance Brokers Securities and Exchange Board of India SEBI Act, 1992 – SEBI Guidelines.

OUTCOME

- The students are now familiarized with the principles of legal and regulatory framework of corporate business.
- In this **course** an attempt is made to introduce the students to certain important **legal aspects of business**.
- The **course** is divided into four modules dealing with formation of contract, breach of contract and its remedies; competition; formation of companies and its management; and dispute resolution.

REFERENCE BOOKS

1. K.C.MISHRA–LegalandRegulatoryAspectsofInsurance.
2. K.C.GARG–CompanyLaw.
3. N.D.KAPOOR– Elementsofmercantilelaws.
4. N.D.KAPOOR–LegalandRegulatoryframeworkofbusiness.
5. N.K.SENGUPTA–Environment &Management

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COURSECODE	COURSE TITLE	L	T	P	C
20261DSC25B	Elective-II-B-Retail Management	5	0	0	4

AIM:

To familiarize students with the decisions involved in running a retail firm and the concepts and principles for making those decisions.

OBJECTIVES

1. To familiarize students with the decisions involved in running a retail firm and the concepts and principles for making those decisions.
2. To introduce the Scope and significance of Retail industry, Trends and Challenges.
3. To comprehend knowledge on all areas of Retail business operations.

UNIT I:

Introduction to Retailing: Concept of retailing, Functions of retailing, Terms & Definition, Retail formats and types, Retailing Channels, Retail Industry in India, Importance of retailing, changing trends in retailing.

UNIT II:

Understanding the Retail Consumer:

Retail consumer behavior, Factors influencing the Retail consumer, Customer decision making process, Types of decision making, Market research for understanding retail consumer

UNIT III:

Retail Market Segmentation and Strategies: Market Segmentation and its benefits, Kinds of markets, Definition of Retail strategy, Strategy for effective market segmentation, Strategies for penetration of new markets, Growth strategies, Retail value chain.

Employability

UNIT IV:

Retail Location Selection: Importance of Retail locations, Types of retail locations, Factors determining the location decision, Steps involved in choosing retail locations, Measurement of success of location

UNIT V:

Merchandise Management: Meaning of Merchandising, Factors influencing Merchandising, Functions of Merchandising Manager, Merchandise planning, Merchandise buying, Analyzing Merchandise performance

OUTCOMES:

- The role that retailing plays in the distribution component of the marketing mix
- Understanding of the concept of social responsibility and the role it plays in retailing
- Aware of the moral and ethical dilemmas that face the retailing industry in today's business environment
- Development and understanding of implementing a retail strategy.
- Understanding of the increased use of technology in the field of retailing
- Identify key roles within retail businesses

REFERENCE BOOKS:

1. Retail Management, Michael Levy & Barton A Weitz, Tata McGraw Hill
2. Retailing Management, Gibson C Vedamani, Jaico Publishing House, Mumbai
3. Retail Strategies - understanding why we shop, Jim, Jaico Publishing House, Mumbai
4. Retail Management, Dunne Lusch,

SEMESTER-II**PRIST UNIVERSITY,
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COURSECODE	COURSE TITLE	L	T	P	C
20261RMC26	Research Methodology	4	0	0	3

AIM

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES

- I. To understand the approaches towards and consumers in good research.
- II. To identify various statistical tools used in research methodology
- III. To appreciate and compose the manuscript for publication

UNIT-I

INTRODUCTION: Research – Importance and its types – research approaches – process – problem formulation – development of Hypothesis – Research design – Determining the sample design – Collecting data – Analysis of data – Identifying research problem.

UNIT-II

MEASUREMENT AND ITS TECHNIQUES : Measurement in research and its problems – meaning of scaling – Tests of sound measurement – Types of scaling – Techniques of measurements – Attitude scales – Summed rating scale – Equal appearing Interview scale – Cumulative scale – Ratingscale – Scale constructing Techniques – Time series analysis – Projection Techniques.

UNIT-III

DATA COLLECTION AND HYPOTHESIS: Classification of data – Sources of data – Collection of primary and secondary data – Questionnaire method – Guidelines for Questionnaire design – Interview technique – Observation Techniques – Processing of Data – Editing – Coding – Tabulation – Interpretation of data – Formulation of Hypothesis – Test of Hypothesis.

UNIT-IV

STATISTICAL TECHNIQUES: Statistical Techniques – Quantitative and qualitative techniques – Measures of central Tendency – Arithmetic mean, Median and Mode – Standard deviation – Karl Pearson's coefficient of correlation – Regression – Chi Square test – Conditions for applying chi-square test – ANOVA – Spearman's Rank Correlation.

UNIT-V

INTERPRETATION AND REPORT WRITING : Interpretation – Techniques of Interpretation – Significance of Report Writing – Different steps in Writing report – Layout of research report – types – oral presentation – mechanics of writing a research report – precautions for writing research reports – Role of computers in Research.

Employability

OUTCOME

- Demonstrate knowledge of research processes (reading, evaluating, and developing)
- Perform literature reviews using print and online databases
- Identify, explain, compare, and prepare the key elements of a research proposal/report
- Select and define appropriate research problem and parameters
- Prepare a project proposal (to undertake a project)
- Understand some basic concepts of research and its methodologies

REFERENCE BOOKS

1. Business Research Methods – Dr. T.N. Srivastava and Mrs. Shailaja Rego
2. Business Research Methods – Alan Bryman and Emmabell
3. Research Methodology – R. Panneer Selvam
4. Research Methods Indian – Donald H. MCBurney and Theresa

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC31	Project Planning and Control	5	1	0	5

AIM

To understand the issues relating to project management and control.

OBJECTIVES

- I. To know the infrastructure for projects and project financing.
- II. To conduct project appraisal.
- III. To understand the purposes of a project report.
- IV. To highlight the role of the exiting project administrative setup

V. **UNIT-I**
Meaning and Definition of project – project management – an overview – The project Identification – Formulation of projects – project planning – stages of Life cycle of a project – system approach of a project.

UNIT-II
Pre feasibility and post conception studies – project feasibility studies and considerations – Detailed project Report as submitted to the financial Institutions.

UNIT-III
Project appraisal – various methods of appraising a project, Financial appraisal – Technical appraisal – socioeconomic appraisal – Managerial appraisal.

UNIT-IV
Project financing – sources and patterns of finance – public sector financing – Role of Tax planning in project.

UNIT-V
Project cost estimation and control – Role of the cost accountant in project management – Role and Leadership of the project managers – Structure and Team Building of project organization – Best practices.

skill development

OUTCOME

- Understand the How Subcontract Administration and Control is practiced in the Industry.
- Understand the contract management, Project Procurement, Service level Agreements and productivity
- Apply the risk management plan and analyse the role of stakeholders.

- Analyse the learning and understand techniques for Project planning, scheduling and Execution Control.
- Understand the conceptual clarity about project organization
- Understand project characteristics and various stages of a project

REFERENCE BOOKS

1. Dr. P.C. K. Rao – project management and control. – Sultan Chand & Sons
2. B.M. Patel – project management – Vikas
3. Rajdeep Roy – Entrepreneurship
4. Dr. Radha – Entrepreneurial Development – Prsana Publication

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COURSECODE	COURSETITLE	L	T	P	C
20261SEC32	AdvancedCorporateAccounting	5	2	0	5

AIM

To gain comprehensive understanding of all aspects relating to Advanced corporate accounting.

OBJECTIVES

- I. To know the importance of Human Resources accounting, inflation accounting and Government accounting in corporate businesses.
- II. To learn the holding, banking and Insurance companies accounting in new formats.
- III. To practice public utilities accounting.

UNIT-I

Self study unit: Human Resource Accounting – Inflation Accounting – Government Accounting.

UNIT-II

Holding companies accounting – consolidated Balance sheet of holding companies

UNIT-III

Bank Accounts (New Format) – profit and Loss account – Balance sheet as per the Guidelines of RBI – classification of advances - Provision for advances.

Employability**UNIT-IV**

Insurance companies Accounts – New Format - Life Insurance Revenue accounts with schedule surplus and valuation balance sheet – Fire and Marine Revenue accounts with schedules.

UNIT-V

Double Account system (or) Accounts of Electricity companies and public utilities.

OUTCOME

- Critically analyse both holder and newer MA methods and their effects in organisations
- Knowledge and understanding about MA issues, including its problems and difficulties
- Part in the design and use of the management accounting system in organisations

- Updated concerning the more recent development in MA and the emergence of new methods
- More advanced level compared to the basic knowledge acquired on the Bachelor level
- Exposure to the company final accounts

REFERENCE BOOKS

1. T.S.Reddy & Dr. A.Murthy. Corporate Accounting
2. S.P.Jain & K.L.Narang–Advanced Accounting.
3. R.Ramachandran and R.Srinivasan–Corporate Accounting.
4. M.C.Shukla and T.S.Grewal–Advanced Accounts.
5. S.P.Iyengar–Advanced Accountancy Vol.–II.

SEMESTER-III

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COURSECODE	COURSE TITLE	L	T	P	C
20261SEC33	BrandManagement	5	2	0	5

AIM:

The aim of branding a product or service is the same everywhere in the world. ...

OBJECTIVE:

- I. Create identification and brand awareness.
- II. Guarantee a certain level of quality, quantity, and satisfaction of a product or service.
- III. Help in the promotion of the product.

UNIT I

Brand- concept – Evolution, perspectives, anatomy, types of brand names, brand name associations, Brands Vs Products, Advantages of Brands to consumers & firms. Brand elements:

Components & choosing brand elements, Branding challenges & opportunities.

UNIT II

Brand positioning – Basic concepts – alternatives – risks – Brands & consumers – Strategies for positioning the brand for competitive advantage – Point of parity – Point of difference –

Buying decision perspectives on consumer behaviour, Building a strong brand – Method & implications.

UNIT III

Brand Image, image dimensions, brand associations & image, Brand identity – perspectives, levels, and prisms. Managing Brand image – stages – functional, symbolic & experiential brands. Brand Equity – Sources of Equity. Brand Equity models, Brand audits. Brand Loyalty & cult brands.

UNIT IV

Leveraging Brands – Brand extensions, extendibility, merits & demerits, Line extensions, linetrap – Co-branding & Licensing Brands. Reinforcing and Revitalisation of Brands – need, methods, Brand Architecture – product, line, range, umbrella & source endorsed brands. Brand Portfolio Management.

UNIT V

Brand valuation – Methods of valuation, implications for buying & selling brands. Applications – Branding industrial products, services and Retailers – Building Brands online. Indianisation of Foreign brands & taking Indian brands global – Issues & Challenges.

Employability

OUTCOMES:

- I. Understand key principles of **branding**.
- II. Explain **branding** concepts and ideas in their own words.
- III. Understand and conduct the measurement of **brand equity** and **brand performance**.
- IV. Practically develop a **brand**, including positioning and communication.

REFERENCE BOOKS:

1. Kevin Lane Keller, Strategic Brand Management, PHI/Pearson, New Delhi
2. Kapferer, Strategic Brand Management, Kogan Page, New Delhi.
3. Harsh Varma, Brand Management, Excell Books, New Delhi.
4. Majumdar, Product Management in India, PHI.
5. Sengupta, Brand Positioning, Tata McGraw Hill.
6. Ramesh Kumar, Managing Indian Brands, Vikas.
7. Chandrasekar, Product Management, Himalaya.
8. A Anandan & Prasanna Mohan Raj – Brand Management – Vijay Nicole Imprints Pvt. Ltd., Chennai

SEMESTER-III**PRIST UNIVERSITY,
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COURSECODE	COURSE TITLE	L	T	P	C
20261DSC34A	Elective-III–A-IndianFinancialSystem	5	0	0	4

AIM

To familiarize with the overall functioning of Indian Financial system.

OBJECTIVES

- I. To gain knowledge on financial and capital market
- II. To understand the importance of primary and secondary markets of shares and securities
- III. To know the functioning of various financial institutions in India

UNIT-I

Indian Financial System – Financial Markets participants and instruments – Money market – Commercial banks – Call money markets – Treasury Bill Market – commercial Bills market and Bill Rediscounting scheme (BRs) – Certificate of Deposits (CDs) and Commercial papers (Cps)

UNIT-II

New issues markets – Function and issue mechanism – New issue markets – Operations – Reforms and investor Protection

UNIT-III

Stock Exchange – Operations – Reforms in secondary market and investor protection – over the counter exchange of India – Depositories

UNIT-IV

Export Import Bank of India – Unit Trust of India – Mutual funds in India – Insurance companies – venture capital funds in India – Seed Capital

UNIT-V

National Housing Bank – National Bank for Agriculture and Rural development – Non – Banking companies – Factoring companies – Securitization and Assets Reconstruction companies.

skill development

OUTCOME

- Knowledge, understanding and skills in the area of international financial relations and tools for its implementation
- Knowledge and understanding of characteristics, activities, principles and specifics of international financial relations

- Ability to summarize and critically evaluate results obtained by researchers in the field of international financial relations
- Ability to analyze and use various sources of information and data in the field and make assessment
- Use methods in the field of international finance in practice
- Economic essence and currency classifications: the concept of currency and its basic classification; characteristics of currencies.

REFERENCE BOOKS

1. P.N. Varshney & D.K. Mittal – Sultan Chand & Sons, Indian Financial System
2. H.R. Machiraju – Indian Financial System
3. Gordon, Natrajan – Financial Market & Services
4. Dr. S. Gurusamy – Financial Services & Market
5. B. Santhanam – Financial Services.

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COURSECODE	COURSE TITLE	L	T	P	C
20261DSC34B	Elective -III-B-InternationalMarketing	5	0	0	4

AIM

It deals With Why, When, What, Where, and How of global Marketing?

OBJECTIVES

- I. To know all data developments and policies for International marketing.
- II. To study the role of global marketing mix.
- III. To identify global marketing issues.

UNIT-I

Framework of International Marketing – Basis of International Trade – Recent Trends in world Trade – Foreign Trade and economic growth – Trends in India's foreign Trade – Institutions Infrastructure for Export promotion in India – Indian Trade policy – Export Assistance.

UNIT-II

Identifying Foreign Markets – Product planning for export – Pricing for exports market entry and overseas distribution system – distribution Logistics for exports promoting products internationally – Overseas market Research – Marketing plan for export.

UNIT-III

New Techniques in International marketing Terms of payments and export finance – Management of risks in International marketing – Global marketing of services – Multinational and their role in International marketing state Trading in India.

UNIT-IV

Legal Dimensions of International Marketing – Export Documents and procedure – Outward FDI flow India and Indian multinationals.

UNIT-V

Issues relating to Globalization – Major Drivers – Status and implications of Globalization – Globalization and Indian economy – Global financial Institutions and Indian economy.

Employability**OUTCOME**

- Have developed an understanding of major issues related to **international marketing**
- Have developed skills in researching and analyzing trends in **global** markets and in modern **marketing** practice

- Be able to assess an organization's ability to enter and compete in **international** markets.
- The course helped the students to learn the importance of International Marketing and the role of exporting assisting Institutions.
- An overview of social, political, legal, technological, economic, behavioral, ethical, and **international** aspects of **marketing**

REFERENCE BOOKS

1. Dr.R.L. Varshney and B. Bhattacharya – International Marketing Management.
2. P. Subbo Rao – International Business.
3. Rathor B.S. and Rathor J.S. – Export Marketing.
4. Balagopal T.A.S. – Export Marketing.
5. Francis Cherunilam – International Trade and Export Management
6. Dr.D.C.Kappor – Export Management

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CourseCode	CourseTitle	L	T	P	C
20211OEC	OpenElective-WritingfortheMedia	4	0	0	2

Aim:

- To equip students to enter into the realm of mass media.

Objective:

- To comprehend the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media
- Learn to write for the media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news- Scoop- Filters- Human interest stories- Recognizing and evaluation news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters- Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media- Inverted pyramid style- Feature style- TV/Broadcast, New style writing
TV/Radio Documentaries- Writing Advertisements- Practical

Reference Book:-

Author	Title of the book	Edition/Year	Publisher
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Susan	Journalism		
JohnHogenberg	ProfessionalJournalism	2012	
M.JamesNeal	NewsWritingand Reporting		SurjeetPublication
M.VKomath	The Journalist's Handbook		
D.SMehtha	MassCommunication&Journalism		

SEMESTER-III

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CourseCode	CourseTitle	L	T	P	C
20212OEC	OpenElective-ApplicableMathematicalTechniques	4	0	0	2

OpenElective -

ApplicableMathematicalTechniquesObjectives:

- TounderstandthebasicconceptofInterpolation.
- ToenhancetheknowledgeaboutAssignmentProblems,ReplacementProblems,DecisionAnalysisandGameTheory.

Outcomes:

- StudentsusingORtechniquesinbusinesstoolsfordecisionmaking
- StudentsdevelopAssignment problemandReplacement problems
- Understandtheconceptofdecisionanalysisandgametheory
- Studentsgetstheknowledgeaboutinterpolation

UnitI

Interpolationwithunequalintervals:Newton's,Lagrange's,andinverseinterpolation

UnitII

AssignmentProblems

UnitIII

ReplacementProblems

UnitIV

DecisionAnalysis

UnitV

GameTheory

References

UnitI,“

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CourseCode		L	T	P	C
20213OEC	BIOMEDICALINSTRUMENTATION	4	0	0	2

Aim:

- To understand the concepts and application of electronic instrumentation in the medical field.

Objective:

- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

UNIT-I: BIOELECTRIC SIGNALS AND ELECTRODES

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT-II: RECORDING SYSTEM AND RECORDERS

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT-III: MEASUREMENT AND ANALYSIS TECHNIQUES

Electro cardiography – measurements of Blood pressure- measurements of Bloodflow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials–Placement of electrodes–Recording setup –Analysis of EEG.

UNIT-IV:MAGNETIC RESONANCE AND ULTRASONIC IMAGING SYSTEMS

Principles of NMR Imaging system–Image reconstruction Techniques–Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultrasound– Physics of ultrasonic waves–medical ultrasound–basic pulse–echo apparatus, A –Scan – echocardiograph (M mode).

UNIT-V:ADVANCED BIOMEDICAL SYSTEMS

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers– Pacing system Analyzer – Defibrillator– Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy–microwave and ultrasonic therapy–pain relief through electrical simulation.

OUTCOMES:

- Define basic medical terms and physical values that can be handled by medical instrumentation,
- Describe methods and implementation of electrical and nonelectrical medical parameters diagnostic,
- demonstrate measuring of basic medical parameters,
- Calculate basic parameters of the equipment for using in electrodiagnostic and electrotherapy,
- Apply safety standards and select disposal method and procedures for electrical diagnostic equipment.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi, (2003). (Unit I, II, IV & V)
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical instrumentation and measurements, PHI, New Delhi. (Unit-III)

Book for Reference

1. M. Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000)

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CourseCode	CourseTitle	L	T	P	C
20214OEC	OpenElective- GREENCHEMISTRY	4	0	0	2

Objectives:

To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Unit I -Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness-Dilution is the solution to pollution-Pollution prevention.

Unit II -Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting so much attention - Why should chemists pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III-BioCatalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Biotransformations-Production of Bulk and fine chemicals by microbial fermentation-Antibiotics – Vitamins - Biocatalysis-synthesis of industrial chemicals by bacterial constructs-Future Trends.

Unit IV -GreenHouse Effect

Greenhouse effect and Global Warming – Introduction-How the greenhouse effect is produced - Major sources of greenhouse gases-Emission of CO₂-Impact of greenhouse effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

Outcomes:

- To understand the environmental status and evolution.
- To know about the Pollution and its prevention measures.
- To familiarize the green chemistry.
- To learn about the bio-catalytic reactions.
- To understand about the vitamins and antibiotics.

References:

1. Introduction to Green Chemistry - M. Rayan and M. Tinnesand
2. New Trends in Green Chemistry - V.K. Ahluw

SEMESTER-III**PRIST UNIVERSITY,
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CourseCode	CourseTitle	L	T	P	C
20217OEC	OpenElective–HerbalMedicine	4	0	0	2

Aim:

- Be able to advise and educate effectively to create a comprehensive wellness plan incorporating herbal, dietary and lifestyle recommendations integrating self-awareness and lessons of nature

Objective

- Possess knowledge of traditional herbal systems as well as an understanding of the principles and practice of modern Western herbalism
- Demonstrate the ability to critically analyze herbal research and contribute to the current body of herbal literature
- Know how to integrate knowledge of raw materials, formulation, and herbal pharmacy for product development purposes
- Know how to effectively educate individuals and groups about herbs
- Be able to demonstrate basic skills in herb identification, harvesting, and preparation
- Be able to address potential safety concerns including herb-drug interactions

Outcomes

- Accurately gather information regarding past and current health status while differentiating between phenomena and the client's interpretation of phenomena
- Synthesize the above information to create a comprehensive assessment of health inputs and processes
- Work with clients to develop individualized goals and a plan for health and wellness

Unit I

Tribal medicine – methods of disease diagnosis and treatment – Plants in folk religion – *Aegle marmelos*, *Ficus benghalensis*, *Curcuma domestica*, *Cyanodactylon* and *Sesamum indicum*.

Unit II

Traditional knowledge and utility of some medicinal plants in Tamilnadu – Solanum trilobatum, Cardiospermum halicacabum, Vitex negundo, Adathoda vasica, Azadirachta indica, Gloriosasuperba, Ecliptaalba, Aristolochia indica and Phyllanthus fraternus.

Unit III

Plants in day today life – Ocimum sanctum, Centella asiatica, Cassia auriculata, Aloe vera. Nutritive and medicinal value of some fruits (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate) and vegetables – Greens (Moringa, Solanum nigrum, Cabbage).

Unit IV

Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

Unit V

Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary/respiratory disorders – asthma – bronchitis – common cold – allergy – from plants.

References

1. Tribal medicine –D.C.Pal&S.K.JainNayaPrakash,206,BidhanSarani,Calcutta,1998
2. ContributiontoIndianethnobotany–
S.K.Jain,3rdedition,Scientificpublishers,B.No.91,Jodhpur,India.2001
3. AManualofEthnobotany–S.K.Jain,2ndedition,1995.
4. Kumar, N.C., An Introduction to Medical botany and Pharmacognosy. Emkay Publications, NewDelhi.1993.
5. Rao,A.P.Herbsatheal.DiamondPocketBooks(P)Ltd.,NewDelhi,1999

SEMESTER-III

**PRIST UNIVERSITY,
THANJAVURM.COM**

CourseCode	CourseTitle	L	T	P	C
20222OEC	OpenElective–M-Marketing	4	0	0	2

OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

OUTCOMES

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley & Sons Inc., 2012.
2. M-Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh, Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge U

SEMESTER-IV**PRIST UNIVERSITY,
THANJAVURM.COM**

COURSECODE	COURSETITLE	L	T	P	C
20261SEC41	IncomeTaxLawandTaxPlanning	5	1	0	5

AIM

To gain knowledge of the basic principles underlying the substantive provisions of the Income Tax Law and their applications.

OBJECTIVES

- I. To compute Income of an Individual under various Heads of Income.
- II. To learn the provisions relating to Tax exemptions and Tax deductions.
- III. To gain knowledge on Tax Planning.

UNIT-I

Direct and Indirect Taxes in India –Charge of Income Tax –Computation of total income and tax Liability – Income as per Sec 2 (24) –Assessment year – Previous year – Residential Status and Incidence of Tax –Basis of charge- Exemptions Income under Sec 10, 11, 12, 13 and 13A.

UNIT-II

Income under the Head Salaries –Definition of the Head ‘Salaries’ – Features of salary- Receipts included under Salaries –Different forms of Salaries –Computation of Taxable salaries – Allowances –Different types- Perquisites – Different types – Valuation of perks Different types of Provident Funds –Tax Planning –Deductions under Sec 80C.

UNIT-III

Income under the Head House Property – charge on Annual Value –Exempted Incomes of House Property- Computation of Income from House Property – Let out House- Annual Value-Gross Annual Value- Gross Annual Value of self occupied house property- Deductions allowed– Tax Planning – Interest on Housing Loan maximum limit.

skill development

UNIT-IV

Incomes under the Head Profits and Gains of Business or Profession –Meaning of Business and Profession –Business Income and Professional Income- Computation of Profits and Gains of business or Professions–Admissible and Inadmissible deductions –Exemptions for Tax Planning.

UNIT-V

Income under Capital Gains – Capital Assets- Exempted Assets-Transfer of Assets- Short term and Long term Capital Gains-Application of Cost Inflation Index–Exempted Capital Gains-Taxable

**Capital Gains-Tax Planning in Capital Gaining–Income from Other Sources–
Taxable Income from Other Sources-General Income and Specific Income-causal Income–Deductions–
Tax Planning.**

OUTCOME

- File ITR return on individual basis
- Compute the total Income and define tax complications and structure.
- In order to familiarize the different know-how and heads of income with its components
- It helps to build an idea about income from house property as a concept
- Make the students familiarize with the concept of depreciation and its provisions
- It gives more idea about the income from business or profession

REFERENCE BOOKS

1. Income Tax Act, 1961 as amended upto late.
2. Dr. Vinod K. Singhaniania–Students Guide to Income Tax
3. T.S.Reddy & Y.Hari Prasad Reddy–Income Tax Law and Practice
4. T.N.Manoharan–Students, Hand Book on Income Tax Law.

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COURSECODE	COURSETITLE	L	T	P	C
20261SEC42	InternationalBusiness	6	0	0	5

AIM

To understand the importance of the Global Business and the functions of multinational corporations.

OBJECTIVES

- I. To learn latest available information and data on International Business.
- II. To explain the various methods of entry to foreign market.
- III. To study the role of multinational corporation in the Global context.

UNIT-I

International Business: An overview – Evolution of International business – Drivers of Globalization – Influences of International business – Stages of Internationalization – Differences between domestic business and International business – International business Approaches – Modes of entry – Goals of International business – Advantages of International business – Problems of International business.

UNIT-II

International Business Environment: Introduction – Social and cultural environment – Technological environment – Economic environment – Political environment – Legal environment. **UNIT-**

III

Modes of Entering International Business: Introduction – Modes of entry – Exporting, Licensing, Franchising, Contract manufacturing, Management contracts, turnkey projects, foreign direct investment, Joint ventures – comparison of Different modes of entry – Functional Alliances – managing conflicts situations – Break-Up of – Alliances..

Employability**UNIT-IV**

Foreign Direct Investment: Meaning – International Investment Theories – Factors Influencing FDI – Reasons for FDI – costs and benefits of FDI – Trends in FDI – Foreign Direct Investment in India. **UNIT-**

V

Multinational Corporations: Definitions and concepts – Factors that contributed for the growth of MNCs – Advantages and Disadvantages – control over MNCs – Organizational structure of MNCs –

OUTCOME

- HavedevelopedanunderstandingofmajorissuesrelatedtointernationalBusiness
- Have developed skills in researching and analyzing trends in global markets and in modernmarketingpractice
- Anorganization’sabilitytoenterandcompeteininternationalmarkets.
- DevelopskillsinresearchingandanalyzinginternationalBusinessopportunities
- DevelopahighlevelofanalyticalskillsandcriticalthinkinginaninternationalBusinesscontext
- Explainthemaininstitutionsthatshapetheglobalmarketplace;

REFERENCE BOOKS

1. FrancisCherunilam–InternationalBusinessTextandCases
2. Dr.R.L.Varshney&Bhattacharya–InternationalMarketingManagement
3. P.SubbaRao–InternationalBusiness.

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COURSECODE	COURSETITLE	L	T	P	C
20261SEC43	Co-operationinIndiaandAbroad	6	0	0	5

AIM

To understand the basic principles of co-operation and their applications in India and Abroad.

OBJECTIVES

- I. To study the functioning of various co-operative organizations in India.
- II. To gain knowledge about co-operative movement in foreign countries.

UNIT-I

Meaning and Definitions of Co-operation – reformulated principles of ICA- Co-operative as a Via – Media between capitalism and Communism – Evolution of Co-operative thought – Co-operative thought of Raiffeisen, Robert Owen- Rochdale Pioneers.

UNIT-II

Evolution of Co-operative movement in India – Pre-independence – Post independence – Co-operation during five year plans. Co-operative Agricultural Credit – Short term credit structure – Primary Agricultural Co-operative banks – Central Co-operative Banks – State Co-operative Bank.

UNIT-III

Long – term credit structure – Working of Primary and State Co-operative Agricultural and Rural Development Bank – NABARD and NCDC- Non-Agricultural credit – Urban Banks – Employees credit societies – Housing Co-operatives.

UNIT-IV

Objects – working and problems of marketing co-operatives- Consumer Co-operatives, Industrial Co-operatives- Co-operative farming and milk- Co-operatives – State aid and Co-operative education and training – State Co-operative Union and National Co-operative Union..

UNIT-V

Co-operative Movement in Foreign Countries: England, Germany, Denmark and Japan, Impact of Globalization on Co-operatives.

skill development

OUTCOME

- Know about the company law in the Abroad.
- Understand the use of the memorandum of association and article of association in a company, they also learn from this course
- Develop Professionals in the field of Co-operation, Co-operative law and Management.
- Promote qualified, Skilled and professional manpower to manage the affairs of the Cooperative Institutions.
- Enhance the Knowledge base of the in-service Personnel on the subject Co-operation, Co-operative law and Co-operative Management.
- Enable the in-service personnel to develop skills on Co-operative Management Techniques

REFERENCE BOOKS

1. B.S.Mathur–Co-operation in India
2. Hajeela–Co-operation in India and Abroad
3. Tamilnadu Journal of Co-operation

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COURSECODE	COURSE TITLE	L	T	P	C
20261DSC44A	Elective-IV–A-CustomerRelationshipManagement	5	0	0	4

AIM:

The **aims** of our **Customer Relationship Management training course** are to teach you how

OBJECTIVES:

- I. To facilitate the student to understand the process of CRM, implementation of CRM strategies and customization of services.
- II. To understand your role in achieving good **customer relationship management** with a **customer** and/or stakeholders....
- III. To understand the skills to communicate with and influence **customers** & stakeholders.

UNIT I

Introduction and Significance-CRM Emerging Concepts; Need for CRM; CRM Applications; CRM Decisions; The Myth of Customer Satisfaction; CRM Model; Understanding Principles of Customer

Relationship; Relationship Building Strategies; Building Customer Relationship Management by Customer Retention; Stages of Retention; Sequences in Retention Process; Understanding Strategies to Prevent Defection and Recover Customers.

UNIT II

CRM Process: Introduction and Objectives - an Insight into CRM and e-CRM/ online CRM; The CRM cycle - Assessment Phase; Planning Phase; The Executive Phase; Modules in CRM, 4C's of CRM Process;

CRM Process for Marketing Organization; CRM Affiliation in Retailing Sector; Key CRM features.

UNIT III

CRM Architecture: IT Tools in CRM; Data Warehousing - Integrating Data from different phases with Data Warehousing Technology; Data Mining: - Learning from Information Using Data Mining Technology

like OLAP etc.; Understanding of Data Mining Process; Use of Modelling Tools; Benefits of CRM Architecture in Sales & Productivity; Relationship Marketing and Customer Care, CRM Over Internet.

Employability

UNIT IV

CRM Implementation: Choosing the right CRM Solution; Framework for Implementing CRM: a Step-by-Step Process; Five Phases of CRM Projects

UNIT V

Development of Customizations; Beta Test and Data Import; Train and Retain; Roll out and System Hand-off; Support, System Optimization and Follow-up; Client/Server CRM Model; Use of CRM in Call Centers using Computer Telephony Integration (CTI); CTI Functionality; Integration of CRM with ERP System. Case Studies

OUTCOMES:

- Critically review and interpret the theoretical aspects of CRM across the main areas of sales, services and marketing;
- Exhibit creative and technical practical professional skills and justify the strategy adopted with reference to specified briefs.
- To round out our discussion of marketing information and research, we need to add one more important tool to the mix: customer relationship management (CRM) systems.
- These increasingly prevalent systems are the center piece in how many organizations make sense of and manage marketing data about current and prospective customers.
- A basic understanding of CRM systems can help you recognize their potential for helping organizations use marketing information more effectively.

REFERENCE BOOKS:

1. Mohammed, H. Peeruanda

Sagadevan (2004). Customer Relationship Management. Vikas Publishing House, Delhi.

2. Paul Greenberg (2005). CRM-

Essential Customer Strategies for the 21st Century. Tata McGraw Hill.

3. William, G. Zikmund, Raymond McLeod Jr.; Faye W. Gilbert (2003).

Customer Relationships Management. Wiley.

COURSECODE	COURSE TITLE	L	T	P	C
20261DSC44B	IV-B-InternationalFinancialManagement	5	0	0	4

AIM:

To learn the finance function in the international context.

OBJECTIVES:

- I. To understand the international monetary system
- II. To study foreign exchange management in India.
- III. To know the working capital management in a multinational context.

UNIT-I

The finance function in the international context – The Balance of Payments – International monetary system – Functions of financial management – Challenges of international financial management.

UNIT-II

The foreign exchange market structure and the participants – Types of transactions – Meaning of Currency – Dealing – Exchange rate – Forward rates – Exchange rate computation.

UNIT-III

Working Capital Management in a multinational Context – Short term Borrowing and Investment – Centralized Vs Decentralized cash management – Cash transactions – Equity Financing in the international markets – Accounts receivable and Inventory management.

UNIT-IV

Long term borrowing in international capital markets – The major market segment – International leasing – Foreign direct investments by multinationals – Capital Budgeting.

UNIT-V

International project appraisal – Review of NPV approach – Adjusted present value – Framework – Project appraisal in the international context – Exchange rate risk and cost of Capital – Joint ventures. Employability

OUTCOME:

- Understand international capital and foreign exchange market.



- Identify and appraise investment opportunities in the international environment.
- Identify risk relating to exchange rate fluctuations and develop strategies to deal with them
- Identify and evaluate foreign direct investment and international acquisition opportunities
- Develop strategies to deal with other types of country risks associated with foreign operations
- Express well considered opinion on issues relating to international financial management.

REFERENCE BOOKS:

1. Jaiswal–Doing Business on InternatE-Commerce, Galgotia Publications in New Delhi.
2. Ravilalakota & Andrew, B. Whinston, Frontiers of Electronic Commerce, Addison Wesley.
3. Dr. R.L. Varshney and Dr. S. Bhashyam- International Financial Management.
4. Alan C. Shapiro–Multinational Financial Management
5. Jeff Madura– International Financial Management–Southwest Publications.

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RESEARCH INTEGRATED CURRICULUM

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student; both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching-research relations, the following framework has been developed and widely adopted to help individual staff; course teams and whole institutions analyze their curricula and consider ways of strengthening in students understanding of and through research. Curriculum can be:

Research–Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research-Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research-Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified

as, Level 1: Prescribed Research

Level 2: Bounded

Research Level 3: Scaffolded

Research Level 4: Self-actuated Research

Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Com curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project(Scaffold Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

Internal Assessment:	40 Marks
• Seminar Report (UG)/Concept Note (PG) : 5X4=20 Marks	
• Seminar Review Presentation : 10 Marks	
• Literature Survey : 10 Marks	
Semester Examination:	60 Marks
(Essay type Questions set by the concerned resource persons)	

Blueprint for assessment of student's performance in Socio Technical Project

Continuous Internal Assessment through Reviews:	40 Marks
• Review I : 10 Marks	
• Review II : 10 Marks	
• Review III : 20 Marks	
Evaluation of Socio Technical Practicum Final Report:	40 Marks
Viva-Voce Examination:	20 Marks
Total:	100 Marks

Blueprint for assessment of student's performance in Research Methodology

Courses Continuous Internal Assessment:	20 Marks
• Research Tools (Lab) :	10 Marks
• Tutorial:	10 Marks
Model Paper Writing:	40 Marks
• Abstract:	5 Marks
• Introduction:	10 Marks
• Discussion:	10 Marks
• Review of Literature:	5 Marks
• Presentation:	10 Marks
Semester Examination:	40 Marks
Total:	100 Marks

SCHOOL OF COMEMRCE AND MANAGEMENT

DEPARTMENT OF BUSINESS MANAGEMENT

1.1.3

**Number of courses having focus on employability/ entrepreneurship/ skill
development during the year**



PRISTSCHOOL OF BUSINESS

PONNAIAHRAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY (PRIST)

THANJAVUR



BACHELOR OF BUSINESS ADMINISTRATION CURRICULUM

(2020 ONWARDS)

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

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Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

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Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

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Research-Tutored:engaginginresearchdiscussions

Herethefocusisonstudentsandstaffcriticallydiscussingongoingresearchinthediscipline.

Allfourwaysofengagingstudentswithresearchandinquiryarevalidandvaluableandcurricula canandshouldcontainelements ofthem.

Moreover,thestudentparticipationinresearchmaybeclassifiedas,Level

1:PrescribedResearch

Level 2: Bounded

ResearchLevel 3: Societal

ResearchLevel 4: Self actuated

ResearchLevel5:OpenResearch

Taking into consideration the above mentionedfacts in respect of integrating researchinto the BBA 2020 Curriculum,the following Research Skill Based Courses are introduced inthe BBA2020Curriculum.

Semester	RSB Courses	Credits
II	ResearchLedSeminar	1
III	ResearchMethodology	3
V	ParticipationBoundedResearch	2
VI	ProjectWork	4

Blueprint for assessment of student's performance in Research Led Seminar Course

Internal Assessment:	40 Marks
• Seminar Report (UG)/Concept Note (PG)	:5X4=20 Marks
• Seminar Review Presentation	:10 Marks
• Literature Survey	:10 Marks
Semester Examination:	60 Marks
(Essay type Questions set by the concerned resource persons)	

Blueprint for assessment of student's performance in Research Methodology

Courses Continuous Internal Assessment:	20 Marks
• Research Tools (Lab):	10 Marks
• Tutorial:	10 Marks
Model Paper Writing:	40 Marks
• Abstract:	5 Marks
• Introduction:	10 Marks
• Discussion:	10 Marks
• Review of Literature:	5 Marks
• Presentation:	10 Marks
Semester Examination:	40 Marks
Total:	100 Marks

BACHELOR OF BUSINESS ADMINISTRATION CourseStructure-2020

CourseCode	CourseTitle	L	T	P	C
SEMESTER I					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami- I/Advanced English-I/Hindi-I/ French-I	4	0	0	2
20111AEC12	EnglishI	4	0	0	2
20160SEC13	PrinciplesofManagement	5	0	0	3
20160SEC14	ManagerialEconomics	5	0	0	3
20160AEC15	BusinessCommunication	5	0	0	4
20160AEC16	BusinessMathematicsandStatistics	4	0	0	3
Total		27	0	0	19
AUDIT COURSE					
201LSCIC	IndianConstitution	-	-	-	2
201LSCUV	UniversalHumanValues	-	-	-	2
SEMESTER II					
20110AEC21/ 20131AEC21/ 20111AEC21	TamilIII/ HindiIII/ Advanced EnglishII	4	0	0	2
20111AEC22	EnglishII	4	0	0	2
20160SEC23	FinancialAccounting	5	0	0	3
20160SEC24	OrganizationalBehavior	5	0	0	3
20160AEC25	BusinessEnvironment	5	0	0	4
20160AEC26	ManagementInformationSystem	4	0	0	3
RESEARCH SKILL BASED COURSE					
20160RLC27	ResearchLedSeminar	0	0	0	1
Total		27	0	0	18
AUDIT COURSES					
201LSCCS	CommunicationSkills	0	0	0	2
201SSCBE	BasicBehavioralEtiquette	0	0	0	2

	EMPLOYABILITY
	SKILL DEVELOPMENT
	ENTREPRENEURSHIP

SEMESTER III					
20110AEC31/ 20131AEC31/ 20111AEC31	Tamil III/ Hindi III/ Advanced English III	4	0	0	2
20111AEC32	English III	4	0	0	2
20160SEC33	Management Accounting	4	0	0	3
20160SEC34	Marketing Management	4	0	0	3
20160AEC35	Business Law	5	0	0	4
20160AEC36	Human Resource Management	4	0	0	3
RESEARCH SKILL BASED COURSE					
20160RMC37	Research Methodology	2	0	0	2
	Total	27	0	0	20
AUDIT COURSES					
201LSCOA	Office automation	0	0	0	2
SEMESTER IV					
20110AEC41/ 20131AEC41/ 20111AEC41	Tamil IV/ Hindi IV/ Advanced English IV	4	0	0	2
20111AEC42	English IV	4	0	0	2
20160SEC43	Total Quality Management	5	0	0	3
20160SEC44	Cost Accounting	4	0	0	3
20160AEC45	Retail Management	4	0	0	4
20160AEC46	Industrial Relations and Labour Law	4	0	0	3
201ENSTU47	Environmental Studies	2	0	0	2
	Total	27	0	0	20
AUDIT COURSE					
201LSCLS	Leadership and Management Skills	0	0	0	2
201SSCAQ	General Aptitude and Quantitative Ability	0	0	0	2
SEMESTER V					
20160SEC51	Financial Management	6	0	0	5
20160SEC52	Services Marketing	5	0	0	3
20160SEC53	Production and Operations Management	5	0	0	3
20160SEC54	Global Business Management	6	0	0	4
20160DSC55	Discipline Specific Elective – I	5	0	0	3
RESEARCH SKILL BASED COURSE					
20160BRC56	Participation Bounded Research	0	0	0	1
	Total	27	0	0	20
AUDIT COURSE					
201ACLSPSL	Professional Skills	0	0	0	2
SEMESTER VI					
20160SEC61	Business Policy and Strategic Management	5	0	0	4
20160SEC62	Entrepreneurial Development	6	0	0	5
20160SEC63	Logistics and Supply Chain Management	5	0	0	4
20160DSC64	Discipline Specific Elective – II	5	0	0	3
201_OEC(2 Digit Course Nae)	Open Elective	4	0	0	2

20160PRW66	Project Work	0	0	0	4
20160PEE	Programme Exit Exam	0	0	0	2

		Total	25	0	0	24
	AUDIT COURSE					
201SSCIM	Interview Skills Training and Mock Test	0	0	0	2	
201LSCCE	Community Engagement	0	0	0	1	
Total Credits - Programme						116
Total Credits - Audit Courses						20

Semester	Elective No	Course Code	Course Title
V	I	20160DSC55A	Advertising and Salesmanship
		20160DSC55B	Investment Management
VI	II	20160DSC64A	Customer Relationship Management
		20160DSC64B	Tally Prime

Discipline Specific Elective Courses

Open Elective Courses

Semester	Course Code	Course Title	Department
VI	20111OEC	Journalism	English
	20114OEC	Food and Adulteration	Chemistry
	20116OEC	Wild life conservation	Microbiology
	20120OEC	E-Learning	Computer Science
	20161OEC	Banking Services	Commerce

	EMPLOYABILITY
	SKILL DEVELOPMENT
	ENTREPRENEURSHIP

Audit Courses & Audit Courses on Soft Skills

Semester	Elective No	Course Code	Course Title
I	I	201LSCIC	Indian Constitution
	II	201LSCUV	Universal Human Values
II	I	201LSCCS	Communication Skills
	II	201SSCBE	Basic Behavioral Etiquette
III	I	201LSCOA	Office automation
IV	I	201LSCLS	Leadership and Management Skills
	II	201SSCAQ	General Aptitude and Quantitative Ability
V	I	201ACLSPSL	Professional Skills
VI	I	201SSCIM	Interview Skills Training and Mock Test
	II	201LSCCE	Community Engagement

	EMPLOYABILITY
	SKILL DEVELOPMENT
	ENTREPRENEURSHIP

SEMESTER-I

CourseCode	CourseTitle	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

• டிரிட் நிசர்நிலைப் பல்கலைக்கழகம்- வல்லம் தஞ்சாவூர்

தமிழ்
முதல் பருவம்
முதலாம் ஆண்டு -(BBA , BA, B.COM, CS ,Bsc)
இக்கால இலக்கியம் - செய்யுள் , சிறுகதை , நாடகம் , இலக்கிய வரலாறு
அலகு : 1.செய்யுள் :

1. தாயுமானவ கவாடிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்
2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்
3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்
4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்
5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள் - தமிழ் இனிமை , தமிழ் உணர்வு

அலகு : 2. செய்யுள்:

6. நாமக்கல் கவிஞர் - தமிழ் தேன், தமிழ் வளர்ச்சி சபதம் செய்வோம் , 40 அடிகள்
7. ந.பிச்சமூர்த்தி - வழித்துணை - கவிதை கருடன் , 42 அடிகள்
- 8.கரதா - தேன்மழை, கல்பை , 22 அடிகள்
9. கண்ணதாசன் - இலக்கியம் , ஒரு பாணியின் கதை , 54 அடிகள்
10. அப்துல் ரகுமான் - சொந்த சிறகுகள், சும்பையை கிளறும் சிறகுகள், 80 அடிகள்

அலகு : 3. சிறுகதை :

11. க.சமுத்திரம் - வேரில் பழுத்த பவா

அலகு : 4. நாடகம் :

12. கு. வெ. பாலகம்பிரமணியன் , கௌதம புத்தர் (உரைநடை நாடகம்)

அலகு : 5. இலக்கிய வரலாறு

13. சிறுகதை , புதினம், நாடகம் உரைநடை , கவிதை , புதுக்கவிதை

CourseCode	CourseTitle	L	T	P	C
20111AEC11	ADVANCED ENGLISH-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proofread
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT-I

Glossary of grammar terms
Figures of speech

UNIT-II

Foreign words and phrases
British and American Vocabulary

UNIT-III

Speeches of famous people:
Mahatma Gandhi - Abraham Lincoln - Swami Vivekananda - John F. Kennedy

UNIT-IV

Editing
Proofreading

UNIT-V

Comparison and contrast
Cause and effect

References:

English Grammar - Wren and
Martin English Grammar and Composition - Radhakrishna Pillai
Essentials of Business Communication - Rajendra Pal & J.S. Korlahalli
Sultan Chand & Sons
English for writers and translators - Robin Macpherson
Technical Communication - Meenakshi Sharma & Sangeetha
Sharma The World's Great Speeches -
Sudhir Kumar Sharma Galaxy Publishers English Workbook-I&II -
Jewelcy Jawahar

Coursecode	CourseTitle	L	T	P	C
20111AEC12	ENGLISH-I	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature

UNIT-I

The Art of Reading

-Lin Yutang

An Eco-Feminist Vision

-Aruna Gnanadason

UNIT-II

The Merchant of Death

-Nanda Kishore Mishra & John Kennet

She Spoke for all Nature

-Young World 'The Hindu'

UNIT-III

Because I could not stop for Death

-

Emily Dickinson Stopping by Woodson a Snowy Evening

-

Robert Frost

UNIT-IV

Enterprise

-Nissim Ezekiel

Love poem for a wife

-A.K.Ramanujam

UNIT-V

Oliver Twist

-Charles Dickens

References:-

The Art of Reading/Experiencing Poetry.

-S.Murugesan and Dr.K.Chellappan
Emerald Publishers

CourseCode	CourseTitle	L	T	P	C
20160SEC13	PRINCIPLESOFMANAGEMENT	5	0	0	5

AIM:To enhanceproductionandproductivity,decreasecostof productionandmaximizeprosperitybothforemployerandemployeeshavingcommoninterests.

OBJECTIVE: To familiarize the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms.

COURSE OUTCOMES

1. Evaluate the global context for taking managerial actions of planning, organizing and controlling.
2. Assess global situation, including opportunities and threats that will impact management of an organization.
3. Integrate management principles into management practices.
4. Assess managerial practices and choices relative to ethical principles and standards.
5. Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.

PREREQUISITE:Introductiontothemanagementprocess,emphasizingplanningandstrategy,andorganization albehavior,directionandcontrolincludingleadership,motivation,teambuilding,managementinformationsy stems.

UNIT-I

Organization - Management – Importance – concepts- Nature – functions- Role of managers- Management and administration – Evolution of management thought – Modern management approaches –MBO–MeritsandDemerits.

UNIT-II

Nature and purpose of planning – Planning process - types of plans - strategies – Types of strategies–DecisionMaking-Types -Process-Rationaldecisionmaking process.

UNIT-III

Natureandpurposeoforganizing-Organizationstructure–Processoforganization– Departmentalization– Spanofcontrol–Delegationofauthority,responsibility–Accountability –Centralizationanddecentralization- SelectionandRecruitment.

UNIT-IV

Directing – Principles – Elements – Motivation, Theories of motivation: Maslow, Herzberg,Vroommodels–Communication-Hurdlestoeffective communication

UNIT-V

Control–Controlling–Needforcontrol–Controlprocess–Controltechniques.Leadership leadership theories – Styles– Managerialgrid.Co-ordination–meaning– need – types.

Employability

References:

- L.M.Prasad–SultanChand&Sons.
- T.M.Ramasamy–HimalayaPublishingHouse.
- P.C.Tripathi,P.N.Reddy –TataMcGraw–HillPublishingHouse.

CourseCode	CourseTitle	L	T	P	C
20160SEC14	MANAGERIALECONOMICS	5	0	0	5

MANAGERIALECONOMICS

AIM: Economics is inevitable to business and hence to teach basic of economics to students of Business Administration

COURSE OBJECTIVES

1. To educate the students to understand the fundamentals of economics
2. To understand the application of economics in business decisions
3. To familiarize the students with the economic tools for business analysis.

COURSE OUTCOMES

1. Apply the knowledge of the mechanics of supply and demand to explain working of markets
2. Describe how changes in demand and supply affect markets
3. Understand the choices made by a rational consumer
4. Explain relationships between production and costs
5. Define key characteristics and consequences of different forms of markets

PREREQUISITE: A minimum level of knowledge to understand and application of Economics

SYLLABUS

UNIT I Introduction – Natural & Scope of Managerial Economics – Significance of Managerial Economics.

UNIT II Demand Analysis – Basic Concepts and Tools for Analysis of Demand – Demand forecasting.

UNIT III Cost Concepts and Cost Analysis – Production Function – Cost Price – Output Relations.

UNIT IV Price and Output Decisions under different Market Structures Perfect Competition – Monopoly – Monopolistic Competition – Oligopoly – Pricing Policy – Pricing Methods and Approaches – Product Line Pricing – Price Forecasting.

UNIT V National Income – definition, measurement – Factors – difficulties in measurement. GDP – NDP – Business cycle – phases – Inflation – types and control measures. Managerial Economics in the Context of Globalization.

Employability

TEXTBOOK

1. Dr. Sankaran S., “Managerial Economics”, Margham Publications, 2009.

References:

1. Varshney & Maheswari, “Managerial Economics”, Sultan Chand & Sons, 2007. 2. Victor L. Mote & Samuel Paul, “Managerial Economics”, Tata McGraw-Hill Education, 2007

CourseCode	CourseTitle	L	T	P	C
20160AEC15	BUSINESSCOMMUNICATION	4	0	0	4

COURSE OBJECTIVES

To provide an overview of Prerequisites to Business Communication. To put in use the basic mechanics of Grammar. To provide an outline to effective Organizational Communication. To underline the nuances of Business communication. To impart the correct practices of the strategies of Effective Business writing.

COURSE OUTCOMES

- To be familiar with the complete course outline/Course Objectives/Learning Outcomes/ Evaluation Pattern & Assignments
- To participate in an online learning environment successfully by developing the implication-based understanding of Paraphrasing, deciphering instructions, interpreting guidelines, discussion boards & Referencing Styles.
- To demonstrate his/her ability to write error free while making an optimum use of correct Business Vocabulary & Grammar.
- To distinguish among various levels of organizational communication and communication barriers while developing an understanding of Communication as a process in an organization.
- To draft effective business correspondence with brevity and clarity.

PREREQUISITE: Prerequisites to Business Communication- Introduction to Blended Learning & Blackboard. Nuances of Academic writing will be discussed which is a prerequisite to Blended Learning.

UNIT I

Introduction–Definition, Characteristics and need for communication–

Importance of effective communication–Process, Principles of Communication- Barriers of communication.

UNIT II

Means of communication – Oral and Written Communication – Flow of Communication – Types of Communication–Non Verbal Communication.

UNIT III

Introduction to Business Correspondence – Structure Layout – Letters of Enquiries, Offers, Quotations and Tenders–Orders, its execution and Cancellation Letters–Sales Letters.

UNIT IV

Bank Correspondence – Letter between banker and customer, Letter between Head office and Branch Office, Letter between Customer and banker. Insurance Correspondence – Fire, Marine, General and Life Insurance. Export and Import Correspondence.

UNIT V

Reports- Structure and Layout – Business Report Writing – Reports by Individuals, Committees, PressReports, Market Reports – Proposal Writing. Technology – Aided Business Communication – Internet, E-Mail, Web-based Communication, IT Trends in Communication.

Employability

References:

- Managerial Communication – V.P. Michael – Himalaya Publishing House
- Business Communication – Homai Pradhan, D.S. Bhande – Himalaya Publishing House.
- Business Communication – K. Sundar, A. Kumara Raj – Vijay Nicole
- Business Communication – Kathiresan – Dr. Radha – Prasana Publishers.

CourseCode	CourseTitle	L	T	P	C
20160AEC16	BUSINESSMATHEMATICSANDSTATISTICS	2	2	0	4

Aim: To learn the concepts, applications and methods of mathematics and statistics useful for Business operations.

COURSE OUTCOMES

- Describe and discuss the key terminology, concepts tools and techniques used in business statistical analysis
- Critically evaluate the underlying assumptions of analysis tools
- Understand and critically discuss the issues surrounding sampling and significance
- Discuss critically the uses and limitations of statistical analysis
- Solve a range of problems using the techniques covered

Prerequisite: The learners should have Elementary knowledge in mathematic and statistics.

UNIT-IFUNDAMENTALSOFBUSINESSMATHEMATICS

Arithmetic - Ratios and Proportions - Simple and Compound interest including application of Annuity- Set theory and simple application of Venn diagram- Mathematical reasoning – basic application

UNIT-IIINTRODUCTIONTOSTATISTICS

Meaning and scope of statistics, uses of statistics in business, statistical data – primary and secondary – classification of data – frequency distribution – Diagrammatic presentation.

UNIT-III MEASURES OF CENTRAL TENDENCY AND DISPERSION

Mean, Median, Mode, Mean Deviation - Quartiles and Quartile Deviation - Standard Deviation - Co-efficient of Variation, Coefficient of Quartile Deviation

UNIT-IV CORRELATION AND REGRESSION

Scatter diagram - Karl Pearson's Coefficient of Correlation - Rank Correlation - Regression lines, Regression equations, Regression coefficients

UNIT- V INDEX NUMBERS & TIME SERIES ANALYSIS

Index Numbers - Uses of Index Numbers - Methods of construction of Index Numbers - Problems involved in construction of Index Numbers - **Time Series Analysis** – Components of Time series – Methods of computing time series - Moving Average Method - Method of Least Squares.

Skill Development and Employability

TEXTBOOKS

- Statistical Methods – S.P.Gupta
- Fundamentals of Statistics – D.L.Elhance
- Business Mathematics and Statistics – NG Das and JK Das.

References:

- EconomicsandBusinessStatistics –M.Sivathanupillai
- ElementsofStatistics –B.N.Asthana
- Schaum’soutlineofStatistics– MurrayRSpiegeland LarryJ.Stephens

SEMESTER II

CourseCode	CourseTitle	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம் வல்லம் தஞ்சாவூர்
பாட குறியீடு :

தமிழ்

இரண்டாம் பருவம்

முதலாம் ஆண்டு - (BA , Bsc ,B.COM , BBA)

செய்யுள் , சக்தி இலக்கியம், சிற்றிலக்கியம் , இலக்கிய வரலாறு

அலகு : 1 . செய்யுள்:

- 1 . திருஞானசம்பந்தர் தேவாரம் - கோளறு பதிகம்
- 2 . திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை
- 3 . சுந்தரர் தேவாரம் - திருநொடித் தான் மலை
- 4 . மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2 . செய்யுள்:

- 5 . குலசேகராழ்வார் - பெருமாள் திருமொழி
- 6 . நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்
- 7 . ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
- 8 . திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3 . செய்யுள்:

- 9 . தினமலர் - மூன்றாம் திருமுறை
- 10 . குமரகுருபரர் - மீனாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்
- 11 . திரிசூடராசப்ப கவிராயர் - குற்றால குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்
- 12 . வீரமாமுனிவர் - திருக்காவ லூர்க் கலம்பகம்

அலகு : 4 . புதினம்

- 13 . கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5 . இலக்கிய வரலாறு

- 14 . சைவ வைணவ இலக்கியங்கள் , சிற்றிலக்கியங்கள் , (பள்ளு - பிள்ளைத்தமிழ் , - பரணி)

CourseCode	CourseTitle	L	T	P	C
20111AEC21	ADVANCEDENGLISH-II	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT-I

E-

mailFa

xMem

os

UNIT-II

Itinerary
Checklist

UNIT-III

Invitation
Circular

UNIT- IV

InstructionRecom
mendations

UNIT-V

Biographiesoffamouspeople:
MotherTeresa-MadamCurie-CharlesChaplin-VikramSarabhai

References:

EnglishGrammar -Wren and
MartinEnglishGrammarandComposition -RadhakrishnaPillai
TechnicalCommunication -
MeenakshiSharma&SangeethaSharmaInspiringLives -MaruthiPublishers
EnglishWorkBook-I&II -JewelcyJawahar

CourseCode	CourseTitle	L	T	P	C
20111AEC22	ENGLISH-II	4	0	0	2

Aim:

- Toacquaintlearnerswithdifferenttrendsofwriting

Objective:

- Toempower studentstoacquirelanguageskillsthroughliterature
- Toenablethestudentstoappreciateliterature
- Todeveloptheconversationalskillsthroughoneactplays

Outcome:

- Readandcomprehendliterature

UNIT-I

Ecology
Gift

-A.K.Ramanujan
-AliceWalker

TheFirstMeeting

-SujataBhatt

UNIT-II

Fueled

-MarcieHans

Asleep

-Ernst Jandl

Buyingandselling

-KhalilGibran

UNIT-III

TheEnd oflivingand TheBeginning ofSurvival

-

ChiefSeattleMyWood

-E.M.Forster

TheMeetingofRaces

-RabindranathTagore

UNIT-IV

TheRefugee

-K.A.Abbas

IHave a Dream

-MartinLutherking

ThosePeopleNextDoor

-A.G.Gardiner

UNIT-V

MarriageisaprivateAffair

-ChinuaAchebe

TheFortuneTeller

-KarelCapek

Proposal

-AntonChekov

References:-

GatheredWisdom

-GowriSivaramanEmeraldPublishers

CourseCode	CourseTitle	L	T	P	C
20160SEC23	FINANCIALACCOUNTING	2	3	0	5

AIM: The Basic purpose of this course is to develop an insight of postulates, principles and techniques of accounting, and utilization of financial accounting information for planning, decision-making and control.

COURSE OUTCOMES ·

- Understand the process of recording and classifying the business transactions and events ·
- Understand the financial statements, viz., Profit and Loss Account, Balance Sheet, and cash flow statement of a sole proprietor. ·
- Understand the role of IFRS/Ind-AS in accounting discipline. ·
- Understand and Analyse the financial statements from different the perspective of different stakeholders using ratio analysis. ·
- Understanding of financial distress or bankruptcy prediction and how to analyse management quality means the concept of beyond balance sheet.

PreRequisite: The Learners should have introductory knowledge about accounting.

UNIT-I

Introduction to Financial Accounting – Definition, Meaning, Nature, Objectives and Uses of Accounting – Accounting Concepts, Principles and Conventions – Books of Accounts –

Branches of Accounting – Differences between various branches of accounting.

Skill Development

UNIT-II

Book Keeping – Single Entry System of Book Keeping – Double Entry System of Book Keeping – Recording of Transactions – Journal – Subsidiary books – Ledger – Trail Balance.

UNIT-III

Final Accounts – Manufacturing account – Trading account – Profit and Loss account and Balance Sheet

UNIT-IV

Depreciation Accounting: Introduction, Meaning of Depreciation, Causes for Depreciation, Need for Depreciation, Computation of the Amount of Depreciation, Depreciation on Additions to Fixed Assets, Methods of Depreciation, Calculation of Depreciation under various methods.

UNIT-V

Consignment - Meaning, features of consignment transaction, distinction between consignment and sale, Joint venture - Meaning, features, difference between joint venture and partnership, joint venture and consignment.

Text Book:

- Advance accounting – S.P. Jain and K. L. Narang – Kalayani Publisher.
- Principles of Accounting – Finney H.A. Miller H.E. Prentice Hall
- Principles of Financial Accounting – S.N. Maheshwari

CourseCode	CourseTitle	L	T	P	C
20160SEC24	ORGANIZATIONALBEHAVIOUR	5	0	0	5

AIM:To provide basic knowledge on various models of organizational behavior, To expose them to the concepts of motivation and group dynamics, To help them acquire interpersonal skills.

OBJECTIVES

To help the students to develop cognizance of the importance of human behaviour. To enable students to describe how people behave under different conditions and understand why people behave as they do. To provide the students to analyse specific strategic human resources demands for future action. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

COURSE OUTCOMES

- Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.
- Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
- Analyze the complexities associated with management of the group behavior in the organization.
- Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

PreRequisite:The Learners should have basic interpersonal skill and Human behaviour

UNIT-I

Organizational Behaviour – Concept – Nature – Models – Others similar fields of study – Disciplines contributing to Organizational Behaviour – Individual Behaviour – Perception.

UNIT-II

Personality–Definition–Determinants–GroupDynamics–
FormalandInformalGroups,GroupNorms,GroupCohesiveness,GroupBehaviourandGroupDecision– making.
Employability

UNIT-III

Leadership–Concept–QualitiesofeffectiveLeadership–LeadershipStyles-DefinitionofPower–
TypesofPower-Sourcesofpower–PowerandPolitics.

UNIT-IV

Definitionof Authority–Characteristics–Types of Authority- Organizationalconflict,sourceofconflicts
– Typesofconflicts–Jobfrustrationand causes.

UNIT-V

Motivation–Concept–Nature–significance- Theoriesof Motivation–Maslow’sneed hierarchytheory
– McGregor’sTheoryXandTheoryY–HerzbergTwoFactorTheory-StressManagement–Concept-Sources-
Effectsofstress-ManagementofStress.

TEXTBOOK:

OrganizationalBehaviour–L.M.PRASAD

References:

- OrganizationTheoryandBehaviour–V.S.P.RAO&D.S.Narayana
- OrganizationalBehaviour-UmaSekaran
- OrganizationalBehaviour-K.Aswathappa
- StephenP.Robins,OrganisationalBehavior,PHILearning/PearsonEducation, 11th edition,2008.
- FredLuthans,OrganisationalBehavior,McGrawHill,11thEdition,2001

CourseCode	CourseTitle	L	T	P	C
20160AEC25	BUSINESSENVIRONMENT	4	0	0	4

AIM:Toenablethelearnertounderstandthevariousbusinessandeconomicenvironments
inachangingbusiness scenario.

OBJECTIVES

To enable students to evaluate business and its environment. To enable students to understand business and society. To enable students to discuss the contemporary issues in business. To enable students to examine and evaluate business in International Environment.

COURSE OUTCOMES

Students would be acquainted with business objectives, dynamics of business and environment, various types of business environment and its analysis.
Students would recall and relate various concepts like business ethics, ethical dilemmas, corporate culture and ethical climate. They would also be acquainted about development of various acts applicable to business in India.
Students would describe and discuss Corporate Social Responsibility, Corporate Governance and Social Audit.

Students would be acquainted with various strategies of Global Trade. They would also discuss Foreign Trade in India, Foreign Direct Investments and its implications on Indian Industries.

UNIT-I

Business environment-concept-significance-factors-environmental influence on business.

UNIT-II

Social and cultural environment- demographic trend- Indian social structure- impact on business- interplay of various systems.

UNIT-III

Political environment-directive principles of state policy-centre-state relations-impact on business-economic environment-sector of economy and their significance-agriculture, industry-service-multinational corporations-meaning-importance- advantages- weakness.

UNIT-IV

Technological environment- choice of technology- problems in selecting appropriate technology-importance to business-social responsibility-meaning-importance-responsibility towards various interest groups.

Employability

UNIT-V

Economic planning and development-government and planning-industrial policies and promotion schemes-government policy and SSI.

References:

- Francis Cherunilam- 'Business Environment'.
- Aswathappak, 'Essentials of Business Environment'.
- Havg VK, 'Economic Environment of Business'.
- Amarchand D, Government and Business.

Course Code	Course Title	L	T	P	C
20160AEC26	MANAGEMENT INFORMATION SYSTEM	4	0	0	4

MANAGEMENT INFORMATION SYSTEM

AIM: The objective of this course is to help the student acquire the basic knowledge of information system so as to enable them to make more efficient use of information for decision making.

PreRequisite: The Learners should have elementary knowledge about information systems

COURSE OBJECTIVES

To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems. To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used. To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.

COURSE OUTCOMES

1. Relate the basic concepts and technologies used in the field of management information systems;
2. Compare the processes of developing and implementing information systems.
3. Outline the role of the ethical, social, and security issues of information systems.
4. Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
5. Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

UNIT-I

Management information system-An overview-concept-evolution and element of MIS-definition-characteristics and basic requirement of MIS- structure- computerized MIS- pre-requisites of an effective MIS.

UNIT-II

System analysis and design-An overview- System study- System design-development and implementation.

UNIT-III

Computers and its effect on MIS- Limitations- MIS and DSS- MIS and information resource management- executive information artificial intelligence and expert system- MIS in Indian organizations-recent developments in information technology.

UNIT-IV

Computers and communication- An overview- the information technology- concept of global village-communication channels-communication networks- local area networks-wide area networks-video conferencing.

UNIT-V

Client/server computing communication servers-digital networks-ERP systems-inter-

organizational information systems- value added networks- networking E-commerce and internet- application of internet and website management.

Employability

References:

- O'Brien, James A, Management Information Systems.
- Sadogopans, Management information System, PHI.
- Lucas, Management information System.
- Sen, Management information System.

SEMESTER III

CourseCode	CourseTitle	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

- பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம் வல்வம், தஞ்சாவூர்
பாட குறியீடு : 20110AET31

தமிழ்

மூன்றாம் பருவம்

முதலாம் ஆண்டு (BA , Bsc , B.COM, BBA)

செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு

செய்யுள்

அலகு : 1

- 1 . சிலப்பதிகாரம் - மனையறம் படுத்த காதை
- 2 . மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
- 3 . சூவக சிந்தாமணி - விமலையர் இலம்பகம்

அலகு : 2

- 4 . பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
- 5 . கம்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்

அலகு : 3

- 6 . சூறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
- 7 . தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு : 4

- 8 . நளவெண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

- 9 . காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

CourseCode	CourseTitle	L	T	P	C
20111AEC31	ADVANCEDENGLISH-III	4	0	0	2

Aim:

- ToimprovetheknowledgeofEnglish

Objective:

- To familiarizewiththeorgansofspeechand the descriptionand classificationofspeech

- sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT-I

The organs of speech
Classification of speech sounds
Vowels and Diphthongs

UNIT-II

Consonants
Consonant cluster

UNIT-III

Syllable
Word
accent
Intonation

UNIT-IV

Idiom
Interpretation of graphics

UNIT-V

Slogan
writing
Writing advertisement

References:

English Grammar - Wren and Martin
English Grammar and Composition - Radhakrishna Pillai
Technical Communication -
Meenakshi Sharma & Sangeetha Sharma
A text book of Phonetics for Indian Students -
T.B. Balasubramanian

Course Code	Course Title	L	T	P	C
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Aim:

- To acquaint students with learning English through literature

Objective:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT-1

The Doctor's World	-R.K.Narayan
The Postmaster	-Rabindranath Tagore
Princess September	-E.Somerest Maugham

UNIT-II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT-III

My Brother My Brother	-Norah Burke
Uneasy Home Coming	-Will F. Jenkins
Resignation	-Premchand

UNIT-IV

The Referee	-
W.H.Andrews & Geoffrey Dreamer	The Case of the Stolen Diamonds -
Farrell Mitchell	

UNIT-V

The Dear Departed	-
Stanley Houghton	The Princess and the Wood Cutter-
Alan Alexander Milne	

References:-

Nine Short Stories	-Steuart H.King Blackie Books One-
Act plays of Today	-T.Prabhakar Emerald Publishers

CourseCode	CourseTitle	L	T	P	C
20160SEC33	MANAGEMENTACCOUNTING	2	3	0	5

AIM:To help students understand the nature and scope of management accounting. Gain knowledge in

OBJECTIVES

To help students to explain basic concepts, importance & functions of Management Accounting. To help the students to illustrate the format of Vertical Financial Statements, analysis and interpretations of Financial Statement. To enable students to calculate the various ratios and interpret it. To enable students to prepare Cash flow statements using Indirect method.

COURSE OUTCOMES

- Students would explain the significance of basic concept, importance & functions of Management Accounting.
- Students would illustrate the Vertical format of financial statements, and also tools of financial analysis such as Trend Analysis, Comparative Analysis and Common Size Statement.
- Students would calculate the various ratios and would be able to discuss the significance and use of the various ratios.
- Students would be able to prepare cashflow statements using Indirect method.
- Students would calculate the estimated working capital requirement of the entity.

the preparation of financial statement analysis, fund flow and Cash flow analysis. Utilize the management tools and techniques to take appropriate financial decisions.

Prerequisite:The Learner Should have Elementary knowledge about financial accounting reports and statements.

UNIT-I

Management accounting – Meaning, Objectives, Nature and Scope of Management accounting – Utility and limitations of management accounting.

UNIT-II

Financial Statement Analysis – Comparative Statements – Common Size Statements Ratio Analysis – significance, Uses and limitations – Computation of various ratio – Profitability, Liquidity, Solvency and Turnover ratio.

Employability

UNIT-III

Fund flow analysis – concept of funds – sources and uses of funds – managerial uses of fund flow analysis - construction of fund flow statement.

UNIT-IV

Cash flow analysis – Distinct of Cash flow from fund flow - utility of Cash flow statement – Construction of Cash flow statement.

UNIT-V

Marginal Costing: Meaning, Features, Advantages, Limitations, Absorption costing **Cost-Volume – Profit Analysis:** Contribution, Break even analysis, Profit Volume Ratio, Margin of safety

References:

- Management Accounting – S.N. MAHESWARI, Sultan Chand & Sons.
- Manmohan and SN. Gopal-Principle of Management Accounting
- Guthmann H. G. Analysis of Financial Statements, New Delhi.
- Anthony R.N. Management Accounting – Text and Cases.

Course Code	Course Title	L	T	P	C
20160SEC34	MARKETING MANAGEMENT	5	0	0	5

AIM: To expose students to marketing concepts and trends in the market. To promote the ability to

relate consumer behaviour and market trends. To make students realize the relationship between marketing channels and corresponding strategies.

COURSE OBJECTIVES

To understand the concepts of marketing management To learn about marketing process for different types of products and services To understand the tools used by marketing managers in decision situations To understand the marketing environment

COURSE OUTCOMES

- Students will demonstrate strong conceptual knowledge in the functional area of marketing management.
- Students will demonstrate effective understanding of relevant functional areas of marketing management and its application.
- Students will demonstrate analytical skills in identification and resolution of problems pertaining to marketing management.

PreRequisite: The learners should have elementary knowledge about market and marketing concepts.

UNIT - I Market and Marketing: Distinction between marketing and selling - Types of market – Concepts–Functions-Marketing management–Objectives–Importance-Marketing Environment-Marketing Information System.

Employability

UNIT - II Market Segmentation: Criteria of effective segmentation – Benefits – Bases for market segmentation-Factors influencing consumer behavior–Buyer motives–Buying process.

UNIT - III Marketing Mix - Product planning and development – Product mix decisions – New product development – Product life cycle and strategies - Pricing – Meaning – Influencing

factors –Objectives –Pricingmethods.

UNIT - IV Marketing channels -Need and importance – Classification – Types of Intermediaries – Wholesalers – Functions – Retailers – Functions - Physical distribution – Elements of physicaldistribution(logistics)

UNIT - V Promotion mix - Personal selling –Process - Advertising – Objectives – Types - Salespromotion–Objectives –Salespromotionmethods,publicityandpublicrelations.

TEXTBOOK:

1. RamaswamyandNamakumari,MarketingManagement3/eRevisedMacMillanILtd

References:

1. PhilipKotler,MarketingManagement,PrenticeHallofIndia.
2. PhilipKotlerandArmstrong,MarketingManagement
3. Saxena, MarketingManagement,TataMcGrawHillPub
4. Pillai&Bhagavathi, ModernMarketing
5. Sherlekar,MarketingManagement
6. VarshneyRLandGuptaSL,Marketing Management

CourseCode	CourseTitle	L	T	P	C
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OBJECTIVES:

- To enlighten the students on the basic principles and legal aspects of business laws.
- To promote the understanding of various legislations relating to business.
- To make them acquire knowledge on the legal aspects in the business environment.

COURSE OUTCOMES:

On completion of this course, learners will be able to: appreciate the relevance of business law to individuals and businesses and the role of law in an economic, political and social context.

Identify the fundamental legal principles behind contractual agreements.

Examine how businesses can be held liable in tort for the actions of their employees.

Understand the legal and fiscal structure of different forms of business organizations and their responsibilities as an employer.

Acquire problem solving techniques and to be able to present coherent, concise legal argument.

Prerequisite

Students must have knowledge of Basic business legislations and concepts

UNIT-I

Contract Act-Definition, Classification-Essentials of a Contract-Offer and Acceptance- Consideration- Contractual Capacity-Free Consent-Legality of Object.

UNIT-II

Performance of Contract-Modes of Discharge of Contract-Remedies for Breach of Contract.

UNIT-III

Law of Agency-Mode of creation-Agency by Ratification-Sub-Agent and Substituted Agent-Termination of Agency.

Employability

UNIT-IV

Sale of Goods Act-Definition-Conditions and Warranties-Transfer of Property-Performance of Contract of Sale- Rights of an Unpaid Seller.

UNIT-V

Partnership-Definition-Essentials-Rights, duties and Liabilities of partners-Types of partnership-Dissolution of partnership.

References:

1. Elements of Mercantile Law- N.D.KAPOOR.
2. Principles of Mercantile Law-B.N.TANDON.
3. Mercantile Law-DAVAR.
4. Business Law-PILLAI & BHAGAVATHI.
5. Mercantile Law-M.C.SHUKLA.

CourseCode	CourseTitle	L	T	P	C
20160AEC36	HUMANRESOURCEMANAGEMENT	4	0	0	4

AIM: To support programs for improving organizational effectiveness by developing policies in such areas as knowledge management, talent management and generally creating a great place to work.

OBJECTIVE: To provide knowledge about management issues related to staffing, training, performance, compensation, human factors consideration and compliance with human resource requirements.

COURSE OUTCOMES

- To develop the understanding of the concept of human resource management and to understand its relevance in organizations.
- To develop necessary skill set for application of various HR issues.
- To analyze the strategic issues and strategies required to select and develop manpower resources.
- To integrate the knowledge of HR concepts to take correct business decisions.

UNIT I

Human Resource Management - Introduction and Importance - Evolution – objectives of Human resource management – role of Human resource management - Human resource policies.

UNIT II

Objectives - Importance of HRP - process of HRP - Job analysis - Job Description - Job Specification - Recruitment - Sources of Recruitment - Selection process - Retention of Employees

UNIT III

Training and Development - Training Process - Methods of Training - Need - Evaluation of Training programmes – Concept of Performance appraisal - methods of Performance Appraisal - Rating Errors - Grievances – causes and its functions – Career Planning - career management.

Employability

UNIT IV

Concepts and Components - Compensation plans - Rewards - Motivation - Theories of motivation - Employee Welfare - Kind of Retirement.

UNIT V Factors influencing industrial relations - State Interventions and Legal Framework -

Role of Trade unions - Collective Bargaining - Workers' participation in management-timemanagement.

References:

1. Decenzo&Robbins,Personnel/HumanResourceManagement,3rded.,JohnWiley&Sons(Pvt.)Ltd.
2. PersonnelManagement–C.BMamoria.
3. HumanResourcesManagement–Ashwathappa.

CourseCode	CourseTitle	L	T	P	C
20160RMC37	RESEARCHMETHODOLOGY	3	0	0	3

AIM: To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases

OUTCOME: Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computational frameworks used in mathematical researches.

PREREQUISITES: Basic computer skills for working in window-environment & Conceptual Knowledge on basic matrices

UNIT I

Research in Management: An Introduction – Definition, meaning and nature – Scope and objects of Research. Types of Research

UNIT II

Research Design – Defining Research Problem and Formulation of Hypothesis – Experimental Designs.-Sampling and types of sampling

UNIT III

Research Process – Steps in the process of Research, Data Collection and Measurement: Sources of Secondary data – Methods of Primary data collection – Questionnaire construction.

Employability

UNIT IV

Data presentation and Analysis – Data Processing – Methods of Statistical analysis and interpretation of Data – Testing of Hypothesis and theory of inference- correlation and regression analysis,

UNIT V

Report writing and presentation – steps in Report writing – types of reports – Format of Reports – Presentation of a Report.

References:

1. C.R.Kothari: Research Methodology, Wiley Eastern Ltd, New Delhi
2. P.Saravanel, Research Methodology, Kitab Mahal, Allahabad.
3. O.R.Krishnaswami : Methodology of Research in Social Science
4. D.Amarchand: Research Methods in Commerce

SEMESTER IV

CourseCode	CourseTitle	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

• இலக். இலக்கியப் பண்டுகளையும் வல்லம் தஞ்சாவூர்
பாட குறியீடு : 20110AET41

குமிழ்
நான்சைப் பருவம்
முதலாம் ஆண்டு (BA, BSC, B.COM, BBA)
செய்யுள், சங்க இலக்கியம், அறு இலக்கியம், செம்மொழி, இலக்கிய வரலாறு

அலகு . 1 : பண்டைய இலக்கியம் - நற்றிணை;

1. நெய்தல் - தோழி கூற்று - பாடல் எண் . 11
2. குறிஞ்சி - தலைவி கூற்று - பாடல் எண். 64
3. முல்லை - தலைவன் கூற்று - பாடல் எண். 142
4. பாலை - நற்றாய் கூற்று - பாடல் எண். 29
5. மருதம் - தலைவி கூற்று - பாடல் எண். 70

குறுந்தொகை

1. குறிஞ்சி - தோழி கூற்று - பாடல் எண். 1
2. முல்லை - செவிலித்தாய் கூற்று - பாடல் எண். 167
3. மருதம் - தலைவி கூற்று - பாடல் எண். 181
4. நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290
5. பாலை - தலைவன் கூற்று - பாடல் எண் . 347

ஐங்குறுநூறு

1. மருதம் - சன்வன் பத்து - முதல் இரண்டு பாடல்கள்
2. நெய்தல் - தோழிக்கு அரைத்த பத்து - முதல் இரண்டு பாடல்கள்
3. குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்
4. பாலை - இளவேனிற் பத்து - முதல் இரண்டு பாடல்கள்
5. முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு . 2 : கவிந்தொகை

1. பாலை - பாடல் எண் . 2
2. குறிஞ்சி - பாடல் எண் . 37

அகநானூறு

1. பாலை - பாடல் எண். 5
2. மருதம் - பாடல் எண். 6

புறநானூறு
பாடல் எண் : 6, 121, 41, 153, 172, 191, 223, 246, 284, 358.

பதிற்றுப்பத்து
இரண்டாம் பத்து பாடல் எண். 4 (நிலம் நூர் வளி விசம்பு)

அலகு . 3 ;

1. பட்டினப்பாலை - முதல் 105 வரிகள்
2. திருக்குறள் - 1. மருந்து 2. உணச்சுமுடைமை 3. அழவு

அலகு . 4 : செம்மொழி வரலாறு ;
(மொழி - விளக்கம் , மொழிக்குடும்பங்கள் , உலகச் செம்மொழிகள் , இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள் , வாழும் தமிழ் செம்மொழி , தொன்மை , தமிழின் சிறப்புகள் , தமிழ் செம்மொழி நூல்கள்)

அலகு . 5 : இலக்கிய வரலாறு
சங்க இலக்கியங்கள் , பதினெண்குழக்கணக்கு நூல்கள்.

CourseCode	CourseTitle	L	T	P	C
20111SEC41	ADVANCED ENGLISH-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT-I

Interviews Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation–Type of questions–Answering techniques.

UNIT-II

Flowchart
Proposals

UNIT-III

Discourse
markers Review

UNIT IV

Grammatical forms
Paraphrasing

UNIT-V

Definition
Writing for and against a topic.

References:

English Grammar - Wren and
Martin English Grammar and Composition - Radhakrishna Pillai
Essentials of Business Communication -
Rajendra Pal & J.S. Korlahalli Sultan Chand & Sons Technical Communication -
Meenakshi Sharma & Sangeetha Sharma
English for writers and translators -
Robin Macpherson English Work Book-I & II - Jewelcy Jawahar

CourseCode	CourseTitle	L	T	P	C
20111AEC42	ENGLISH-IV	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To introduce learner to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Read and comprehend literature

UNIT-I

How to be a Doctor - Stephen Leacock
 My Visions for India -
 A.P.J. Abdul Kalam Woman, not the weaker sex -
 M.K. Gandhi

UNIT-II

My Last Duchess - Robert Browning
 The Toys - Coventry Patmore
 I, too - Langston Hughes

UNIT-III

The Best Investment I ever made -
 A.J. Cronin The Verger - W.S. Maugham
 A Willing Slave - R.K. Narayan

UNIT-IV

Macbeth
 As You Like It

UNIT-V

Henry
 IV Tempe
 st

References:

English for Enrichment -
 .Devaraj Emerald Publishers Selected Scenes from Shakespeare Book I&II -
 Emerald Publishers

CourseCode	CourseTitle	L	T	P	C
20160SEC43	TOTALQUALITYMANAGEMENT	5	0	0	5

OBJECTIVE: To learn the quality philosophies and tools in the managerial perspective.

COURSE OUTCOMES

- To realize the importance of significance of quality
- Manage quality improvement teams
- Identify requirements of quality improvement programs

UNIT I

Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality - Cost of quality.

Employability

UNIT II

Overview of the contributions of Deming, Juran Crosby, Taguchi techniques – Introduction to loss function. Concepts of Quality circle, Japanese 5S principles and 8D methodology

UNIT III

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributes. – Six sigma – concepts of process capability. Total productive maintenance (TMP). Business process improvement (BPI) – principles, applications, reengineering process, benefits and limitations.

UNIT IV

Quality functions development (QFD) – Benefits, Voice of customer, House of quality (HOQ), QFD process. Failure mode effect analysis (FMEA) – FMEA stages, Process and documentation. Seven Tools (old & new) - Benchmarking.

UNIT V

Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture – quality council, motivation, recognition and reward. TQM framework, benefits, awareness and obstacles.

References:

- Douglas C. Montgomery, Introduction to Statistical Quality Control, Wiley Student Edition, 4th Edition, Wiley India Pvt Limited, 2008.
- Poornima M. Charantimath, Total Quality Management, Pearson Education, First Indian Reprint 2003.
- Indian standard – quality management systems – Guidelines for performance improvement (Fifth Revision), Bureau of Indian standards, New Delhi.

CourseCode	CourseTitle	L	T	P	C
20160SEC44	COSTACCOUNTING	2	3	0	5

COURSE OBJECTIVES

To understand the basic accounting concepts and conventions of accounting. To know how the transactions are entered in Double entry book keeping system and various books of accounts. To Prepare the final accounts of an organization and to examine the financial data.

COURSE OUTCOMES

- Developing the ability to use accounting concepts and principles.
- Understanding the nature and purpose of financial statement.
- Demonstrating the ability to use a basic accounting system to create (record, classify and summarize) the business transactions.
- Applying the use of the fundamental accounting equation to analyze the effect of business transactions on an organization.

UNIT-I

Meaning and scope of cost account – Relationship of cost accounting and Financial account – cost analysis – concept and classification – element of cost method – preparation of cost sheet, tender and quotation.

UNIT-II

Purchasing of material -Procedure and documentation involved in purchasing – requisition for store – maximum stock level maximum level reorder level economic ordering quantity perpetual inventory – Bin card – ABC Analysis control over wages – scarp and spoilage. Inventory records method of valuing material.

Employability

UNIT-III

Overhead – Classification of overhead – allocation and absorption of overhead.

UNIT-IV

Process costing – Losses – normal process loss – abnormal loss – abnormal gain – Job costing – contract costing.

UNIT-V

Reconciliation of costs and Financial accounts – Budgetary control.

References:

Advance Cost Accounting – Jain and Narange – Kalyani Publishing.

CourseCode	CourseTitle	L	T	P	C
20160AEC45	RETAILMANAGEMENT	4	0	0	4

Objectives: To gain in-depth knowledge about Retail management practices in Retail Industry.

COURSE OUTCOMES

- Understand the functions of retail business and various retail formats and retail channels.
- Understand the difference between Retail and Manufacturing Supply Chain
- Understand, key drivers of retail supply chain and how to select a retail store location
- Analyze Retail Market and Financial Strategy including product pricing.
- Integrate the various Supply Chain partners and how to collaborate with them

Prerequisite: Students should have mind set of setting Retail outlets. Students must have knowledge on basic retailing concepts

Unit I:

Introduction to Retailing: Concept of Retailing-Functions of Retailing-Terms and Definition of Retailing-Retailing Channels-Importance of Retailing-Retail industry in India.

Employability

Unit II:

Understanding the Retail consumer: Retail consumer Behaviour-Factors influencing retail consumer-Customer decision making Process-Types of Decision Making.

Unit III:

Retail Location Selection: Retail Location-Importance- Types-Factors determining the location of retail outlets-Steps involved in choosing the retail locations

Unit IV:

Retail Space Management and Marketing: Retail Space Management-Store layout and design-Visual Merchandising-Promotions strategy-Relationship Marketing Strategies-CRM-POP displays

Unit V:

Emerging Trends in Retailing: Application of IT to Retailing-Retail Equity-Technology in Retailing-

RetailingthroughtheInternet

References:

- Sivakumar,RetailMarketing,ExcelBooks, FirstEdition,2007.
- RamkrishnanandY.R.Srinivasan,IndianRetailingTextandcases,OxfordUniversityPress,2008.
- SwapnaPradhan,RetailManagement-TextandCases,TataMcGrawHill,3rdEdition,2009.
- Dunne,Retailing,CengageLearning,2ndEdition,2008
- Ramkrishnan andY.R.Srinivasan,Indian RetailingTextandCases,OxfordUniversityPress,

2008

- Dr.JaspreetKaur, CustomerRelationshipManagement, Kogent solution.

CourseCode	CourseTitle	L	T	P	C
20160AEC46	INDUSTRIALRELATIONSANDLABOURLAWS	4	0	0	4

COURSE OBJECTIVE:

The course aims at providing fundamental knowledge and exposure to the industrial relations and related aspects prevailing in industries and to familiarize the students with various Labour Legislations applicable to businesses.

COURSE OUTCOMES

- Describe fundamental concepts and nature of Industrial Relations
- To understand the nature and role of trade unions for workers and industries.
- To study the relevance of collective bargaining and its impact on employee-management relations.
- To understand industrial disputes and ways to resolve them.
- To apply various industrial legislations in business.

UNIT-I

Industrial Relations – Concept – Definition – Significance – Objectives – Scope – Approaches – Principles of good Industrial Relations – Role of state Employers and Unions – Labour and the constitution–ConstitutionalFramework.

UNIT-II

International Labour Movement – International Confederation of Free Trade Unions (ICFTU) – ILO–Origin,history, Objectives andFunctions.

UNIT-III

Industrial Disputes – Meaning – Causes – Forms – Machinery – Joint Consultation – Works Committee – Conciliations – Employee Discipline – Grievance Handling – workers participation in Management – Collective Bargaining – Wage Administration – Wage Regulation Machinery.

UNIT-IV

Factories Act, 2048 – Objects – Provisions relating to health, Workers Compensation Act, 2023

– Objects – Employer’s Liability for compensation – Employee’s state Insurance Act, 2048 – Objects – Registration of Factories and establishments – The ESI Corporation – Standing Committee – Offences and penalties – Miscellaneous Provisions.

Employability

UNIT-V

Industrial Disputes Act 2047 – Objects – Authorities for settlement – Lockouts – Lay-Off – Strikes – Retrenchment – Transfer and Closure – Trade Union Act, 2026 – Objects – Registration – Rights and Liabilities of Registered Trade Unions – Procedure – Penalties.

References:

- Kapoor N.D.–Industrial Laws
- Shukla M.C.–Industrial Laws

CourseCode	CourseTitle	L	T	P	C
201ENVTSTU	ENVIRONMENTALSTUDIES	1	0	0	1

UNIT-I:

The Multidisciplinary Nature of Environmental Studies

UNIT-II:

Natural Resources: Renewable and Non-Renewable Resources

UNIT-III:

Ecosystems

UNIT-IV:

Biodiversity and its Conservation

UNIT-V:

Environmental Pollution

UNIT-VI:

Social Issues and the Environment

UNIT-VII:

Human Population and the
Environment. Skill Development
and Employability

UNIT-VIII:

Fieldwork

References:

Environmental Studies – K. Kumaraswamy, A. Alagappa Moses, M. Vasanthy
(Bharathidasan University – Tiruchirappalli)

SEMESTER V

CourseCode	CourseTitle	L	T	P	C
20160SEC51	FINANCIALMANAGEMENT	4	1	0	5

COURSE OBJECTIVES - Provide an in-depth view of the process in financial management of the firm .Develop knowledge on the allocation, management and funding of financial resources. Improving students’ understanding of the time value of money concept and the role of a financial manager in the current competitive business scenario. Enhancing student’s ability in dealing short-term dealing with day-to-day working capital decision; and also longer-term dealing, which involves major capital investment decisions and raising long-term finance.

COURSE OUTCOMES

- Explain the concept of fundamental financial concepts, especially time value of money.
- Apply capital budgeting projects using traditional methods.
- Analyze he main ways of raising capital and their respective advantages and disadvantages in different circumstances
- Integrate the concept and apply the financial concepts to calculate ratios and do the capital budgeting

UNIT-I

Concept of Finance, Corporate Finance, Finance Functions and other functions. Structures of the Financial System. Financial Management – Meaning, functions and Objectives of Financial Management - Financial Planning and Forecasting of short term and long term

.UNIT- II

Financing Decision Sources of funds - Capital Structure - Theories of capital structure - Factors affecting capital structure - Leverage - Operating, Financial and combined leverage - Cost of capital - Cost of individual components of capital - Weighted Average cost of capital.

UNIT-III

Investment Decision Capital Budgeting Process - Techniques of investment appraisal: Payback period; Accounting Rate of Return - DCF Techniques - Net present value, Profitability Index and Internal Rate of Return

UNIT-IV

Working Capital Decision Meaning - Nature of working capital - Classification and significance of working capital - financing of Working capital - Component of working capital, Cash, Short-term marketable securities - Management of Cash and Receivables.

Skill Development

UNIT-V

Dividend Decision Theories of Dividend - Determinants of dividend - Dividend Policy - Dividend policies in practice

References:

- M. Y. Khan and P. K. Jain Financial management, Text, Problems and cases Tata McGraw Hill, 6th edition, 2011.
- 2. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2012.

- REFERENCES
- PrasannaChandra,FinancialManagement, 9thedition, TataMcGrawHill,2012.

CourseCode	CourseTitle	L	T	P	C
20160SEC52	SERVICEMARKETING	5	0	0	5

OBJECTIVES:Toenablestudentsknowthevariousconceptsofservicesmarketing.To understandthes
 trategiesformanagingandmarketingof services
 anddevisestrategiesformarketingservicesintheliberalizedbusinessenvironment.

COURSE OUTCOMES

1. Understand the Concept of Services and intangible products
2. Discuss the relevance of the services Industry to Industry
3. Examine the characteristics of the services industry and the modus operandi
4. Analyse the role and relevance of Quality in Services
5. Visualise future changes in the Services Industry

Prerequisites: Students must have basic Marketing Knowledge and Mindset. Students should have skills of service attitude

UNIT-I

Introduction–Definition–Distinguishing feature of service–Service offer–Service encounter –Service buying process.

UNIT-II

Relationship marketing and customer loyalty – Managing knowledge – Service positioning and Targeting – Service quality.

Skill Development

UNIT-III

Marketing plans for services – Marketing planning process – Marketing strategy formulation – Resource allocation and monitoring – Marketing planning and services – customer focused services – service quality – Improving service quality – customer retention.

UNIT-IV

Pricing of service – promoting service – Internal Marketing – Managing – capacity – Managing the marketing effort – Marketing process – Position analysis.

UNIT– V

Marketing of services – Bank – Marketing – Insurance Marketing – Hospital Marketing – Telecommunications services – Education – Marketing.

References:

- Principles of Service Marketing – Adrian Palmar (McGraw Hill International)
- Marketing of service Strategies for growth – S.S. Vernekar, Sandeep Goel, B.P. Bhardwaj (Deep and Deep Publication)
- Advtan Payne, Services Marketing Ravishankar, Services Marketing
- Christopher H. Lovelock and Jochen Wirtz, Services Marketing, Pearson Education, New Delhi, 7th edition, 2011.
- Hoffman, Marketing of Services, Cengage Learning, 1st Edition, 2008.

Course Code	Course Title	L	T	P	C
20160SEC53	PRODUCTION AND OPERATIONS MANAGEMENT	5	0	0	5

OBJECTIVES: To enable students understand the nature and importance of production management to comprehend the principles and areas of application of shop floor management and know the operations and skills needed for major decisions in material management.

COURSE OUTCOMES

- At the end of the course the students can apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service related decisions.
- At the end of the course the student will be able to plan production schedules and plan resources (material and machine) required for production
- At the end of the course the students can design maintenance schedules in manufacturing units, identify and propose material handling equipments and implement industrial safety rules

Prerequisite: Students must have interest and Knowledge of Production and sequence of operations. Students those who are having Industrial Knowledge

UNIT-I

Definition of production managements – Scope of production Managements – Functions and Responsibilities of production manager – Evolution of production management.

Employability

UNIT-II

Production planning and Control: Definition of planning – scope of planning – Production planning of control (PPC). Importance methods or Types of production – Continuous production systems (CPS) – Intermittent production system (IPS)

UNIT-III

Plant Location: Definition of Plant location, Steps, Factors affecting the location of a plant – various factors involved in the location

UNIT-IV

PlantLayout:DefinitionPlantLayout,Objectiveofplantlayout–
Types,Principles,Factorsinfluencingplantlayout.

UNIT-V

Material Handling: Definition of material handling – Importance – Objective – Principles –
Typesofmaterialhandling–Inventorycontrol–Factoraffectinginventorycontrol

References:

- OperationalManagement–C. S.V. Murthy(HimalayaPublishingHouse
- ProductionandOperationsManagement–B.S.GOYEL.
- ProductionandOperationsManagement–PANNERSELVAM, PrenticeHallofIndia
- MaterialManagement–M.M.VARMA.
- ProductionManagement–Saravanelsumathi

CourseCode	CourseTitle	L	T	P	C
20160SEC54	GLOBALBUSINESSMANAGEMENT	5	0	0	5

OBJECTIVES:

Tomakestudents

- Understandthefundamentalconceptsofinternationaltrade
- ComprehendbasicprinciplesoftofMNCsand
- AcquirebroadknowledgeonGlobalLiberalizationandWTOAgreements.

COURSE OUTCOMES

- Understand the basic concepts of advertisements & the way the advertisements are created.
- Acquire knowledge about the type of media used and planning/ scheduling of media.
- Understand the ethics to be practiced in advertising.
- Identify the concept and role of Sales management
- Understand the hiring process of sales force management and role of technology in sales.

UNIT-I

International Business: An overview – Types of International Business – Domestic and International Business – Economic and Political Environment – Cultural Environment – Recent World Trade and Foreign Investment Trends.

Employability

UNIT-II

Indian Export Performance – Problems in export trade – Export promotion in India – Export promotion incentives – EPZ & FTZ – 100% EOU – Export Houses – Star Export Houses – Trading Houses – Star Trading Houses – Super Star Trading Houses.

UNIT-III

GATT–UruguayRoundNegotiation-WTO–GATS–TRIMS- TRIPS–Agreement-DisputesettlementunderWTO–TariffBarriers.

UNIT– IV

MNC-Meaning–DominanceofMNCs–MNCsandInternationalTrade-Models–MNCsinIndia.

UNIT–V

GlobalizationofBusiness–RecentTrends-ImplicationandImpact–PolicyOptions-LiberalizationandIntegrationwiththeGlobalEconomy –Impact ofPrivatizationinIndia.

References:

- 1.Francis Cherunilam: ‘International Business’ (EEE), PHI – New Delhi – 20042.(Chapters5,9,20,24&26)
3. InternationalBusiness–ByRakeshMohanJoshi,OxfordUniversityPress,Chennai.
4. VictorLuisAnthuvan–Issues inGlobalization.
5. InternationalBusiness –ByDonaldABallandothers,IndiaEdition,TATAMcGrawHill.
6. InternationalBusiness–S.Shajahan, MacmillanIndiaLtd.,Chennai.
7. InternationalBusiness–JustinPaul, PHILearningPvt.Ltd. NewDelhi.

CourseCode	CourseTitle	L	T	P	C
20160DSE54A	ADVERTISINGANDSALESMANSHIP	3	0	0	3

Objective:To improvethetheknowledgeandcompetencyofadvertising andto havethetheknowledgeofsalesmanship

COURSE OUTCOMES

- Analyze the role of events in image building
- Explain all the steps of planning and organizing an event
- Plan and organize events
- Discuss ways of strategic marketing and media planning for events
- Demonstrate knowledge and ability to identify risk areas, evaluate safety measures

Prerequisite: Students must have knowledge of Marketing and sales process

UNIT-I

Advertising: Advertising and salesmanship – role of importance – Planning for advertisement communication process – Formal and Informal.

UNIT-II

AIDA's formulas - Advertising scope and function – need for Advertising classification – Advertisement planning and organization ethical issue in advertising.

Employability

UNIT-III

Advertising media–Role of Media–Types of Media–Merits and Demerits–
Media research Evaluation and effectiveness of advertising.

UNIT- IV

The Advertising Budget-Advertising Agencies–Advertisement copy–Kinds-Advertising mix.

UNIT-V

Selling as a career-History of selling-Characteristic of a goods salesman and sales

References:

- Advertising Principles problems and Cases –Charles.J.Dirkson.
- Advertising management Concept–Manendra Mohan
- Salesmanship-Sathyanarayanan
- Salesmanship and Publicity-J.S.K.Patel

Course Code	Course Title	L	T	P	C
20160DSE54B	INVESTMENT MANAGEMENT	3	0	0	3

Objective:

- To enable the student to acquire knowledge of Investment management
- On successful completion of this course, the student should have understood
- Investment avenues Security analysis

UNIT I

Concept of investment - importance. Features of Investment, Speculation - Forms of investment - Bank deposits, Post office schemes, Government Securities, Mutual fund schemes, Provident funds, Company deposits-Real estate, Gold & silver.

UNIT II

Investment Instruments-Capital market instruments, Money market instruments, Derivatives-Futures & Options. Shares–types & features. Debentures-nature & types. Primary market - Role of NIM, methods of floating new issues.

UNIT III

Secondary market-functions, Bombay Stock Exchange, National Stock Exchange–trading practices, security market indicators. Return-Risk–kinds. Role of SEBI.

Employability

UNIT IV

Security analysis- Fundamental analysis: economic, industry and company analysis.

Technical Analysis, Dow Theory, types of Charts, important chart patterns.

UNIT V

Efficient Market theory. Random Walk Theory, weak form, semi-strong form & strong form. Portfolio Analysis: Markowitz theory – Portfolio management.

References:

1. Preethi Singh - Investment Management
2. Bhalla G.S. - Investment Management
3. Francis Cherunilam - Investment Management
4. Dr. Avadhani - Investment Management

SEMESTER VI

CourseCode	CourseTitle	L	T	P	C
20160SEC61	BUSINESSPOLICYANDSTRATEGICMANAGEMENT	5	0	0	5

Objectives: To create an awareness of the importance of strategic approach to managerial situations and issues in the context of globalization and liberalization trends

COURSE OUTCOMES

- Critically analyse the internal and external environments in which businesses operate and assess their significance for strategic planning.
- Apply understanding for the theories, concepts and tools that support strategic management in organizations.
- Build understanding of the nature and dynamics of strategy formulation and implementation processes at corporate and business level.
- Enhanced ability to identify strategic issues and design appropriate courses of action

UNIT-I

The concept of strategy policy, planning, evolution strategy, philosophy of strategy.

Employability

UNIT-II

Strategy Alternatives: SWOT Analysis, Environmental analysis – Strategy formulation – Environmental scanning and Industry Analysis, Social responsibility- Strategy formulation – Business Strategy- Corporate Strategy Diversion Strategy portfolio Analysis – BCG growth / Strategy choice – Development of policies.

UNIT-III

Strategy implementation – Organization design, Structure, relationships, Leadership– controlprocess, performance. Organisational resource analysis, matching opportunities and resourcesstrategyandvalues,socialresponsibilities ofmanagements.

UNIT-IV

Stabilitystrategy–Growth–Retrenchment–Turnaround Strategy– Diversification.

UNIT-V

References:

- P. SubbaRao–HimalayaPublishingHouse.
- V.P.Michael.
- AZHARKAZMI–TataMcGraw-Hill
- K-Balasubramaniam,S.UshaPriya–GIGOPublication.

CourseCode	CourseTitle	L	T	P	C
20160SEC62	ENTREPRENEURIALDEVELOPMENT	5	0	0	5

AIM: To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

OBJECTIVES

The concept of entrepreneurship, types, functions and approaches of entrepreneur. The aspects of entrepreneurial mindset and personality. The business opportunities and to equip the learners with process of project formulation and appraisal. The role of venture capitalists and the legal challenges in entrepreneurship development. Strategic perspectives in entrepreneurship.

COURSE OUTCOMES:

- Summarize the concept of entrepreneurship to acquire entrepreneurial skills.
- Explore new vistas of entrepreneurship in the twenty-first century environment to establish new business opportunities.
- Evaluate entrepreneurial mindset and personality of each individual helping to detect difficulties and propose a timely solution.
- Define and comprehend the concept of entrepreneurial motivation in order to assist anyone achieving their personal objectives.
- Recognize the entrepreneurial mindset for giving value to the company.

UNIT I

ENTREPRENEURSHIP

Entrepreneur – Types of Entrepreneurs –

Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

Employability

UNIT II

ENTREPRENEURIAL ENVIRONMENT Business Environment - Role of Family and Society

- Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations - International Business.

UNIT III

BUSINESS PLAN PREPARATION Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Feasibility Report Preparation and Evaluation Criteria.

UNIT IV

FINANCING AND ACCOUNTING Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V

SUPPORT TO ENTREPRENEURS Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting

References:

- Khanka. S.S., “Entrepreneurial Development” S.Chand & Co.Ltd., RamNagar, New Delhi, 2013.
- Donald F Kuratko, “Entrepreneurship – Theory, Process and Practice”, 9th Edition, Cengage Learning 2014.
- Tendon, C: Environment and Entrepreneur; Clough Publications, Allahabad.
- Siner A David: Entrepreneurial Megabooks; John Wiley and Sons, New York.
- Srivastava S.B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.

Course Code	Course Title	L	T	P	C
20160SEC63	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	5	0	0	5

Objectives: To explain basic theory and techniques of Logistics and Supply Chain and to examine the issues and problems faced in a changing and competitive Business Environment

COURSE OUTCOMES

- Understand the fundamentals of elements and functions of supply chain, role of drivers and demand forecasting.
- To apply various techniques of inventory management and their practical situations.
- Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain.
- How various warehousing management system and transportation can be practiced in various industries
- How logistics and supply chain strategies can create value generation and utilise IT applications

Prerequisite: Students should have transportation and operational process knowledge. Students must have basic documentation in Business.

UNIT I

INTRODUCTION-Defining logistics and supply chain management - Growth and Development-

Componentsofsupplychain-Importanceofsupplychainstrategies-SCMPerformance.

UNITII

LOGISTICS MANAGEMENT - Logistics-Functions, Objectives-Managementof Materialsflow in supply chain-Warehouse and Materials storage-Material Handling-Benchmark in bestpractices

Employability

UNITIII

CUSTOMERRELATIONSHIPMANAGEMENT-CustomerRelationshipManagement-outboundlogisticsresourceplanningandManagement-QuickresponsesysteminManufacturing.

UNITIV

LOGISTICS AND SUPPLY CHAIN PERFORMANCE -Management of Inbound logistics-Supply chain cases, Role of a managerin supply chain –Supply chain performance drivers,Value ofSupplychainandimprovement

UNITV

CURRENTTRENDS-Supplychainrelationships–Supplychaincostanalysis–Issuesin

References:

1. BowersoxDonaldJ. LogisticsManagement-
“TheintegratedsupplyProcess”TataMcgrawhill,2000.
2. R.P.MohantyandS.G.Deshmukh,“SupplychainManagement”,Biztantra,2005
3. Coyleetal.,TheManagementofBusinessLogistics,ThomsonLearning,7thEdition,2004.
4. AilawadiCSathish&RakeshSingh,Logistics Management,PHI,
2005.3.BloombergDavidJetal.,Logistics,PrenticeHallIndia,2005.
5. PierreDavid, InternationalLogistics,Biztantra,2003.
6. RonaldH.Ballou,
BusinessLogisticsandSupplyChainManagement,PearsonEducation,5thEdition,2007

CourseCode	CourseTitle	L	T	P	C
2016DSC64A	CUSTOMERRELATIONSHIPMANAGEMENT	3	0	0	3

Objective:ToimproveandenhancerelationshipwithcustomerandBusiness.Toinculcatethehabitintimate relationshipwithtargetcustomer

COURSE OUTCOMES

- Understand the basic concepts of Customer relationship management.
- To understand marketing aspects of Customer relationship management.
- Learn basics of analytical Customer relationship management.
- Understand basics of operational Customer relationship management.

Prerequisite:Studentsmusthavetheattitudeofcustomerisourbusiness.Students shouldthinkthatcustomerisjobprovider

UnitI

IntroductiontoCustomer SupportProduct&Customer– Overview -ImportanceofaCustomer- Consumerbehaviour

UnitII

CustomersupportMethodologyCustomerCentricapproach-ExternalLayersVsInternal Layers - NeedofCustomer SupportMethodologiesfor Customer Support.

Employability

Unit III

Introduction to ERP Introduction: ERP- An Overview- Enterprise- An Overview- Benefits of ERP- ERP and Related Technologies

Unit IV

CRM Basics CRM- Meaning & Definition- Dimensions of CRM- Nature of CRM- Goals of CRM- Advantages of CRM

Unit V

Implementation of CRM- A comprehensive model- Developing CRM vision and strategy Management support

References:

1. Balasubramaniyan, K., Essence of Customer Relationship Management, learn Techpress
2. For Sugar-CRM & Microsoft Dynamic CRM - Refer Internet
3. Kaushik Mukerjee – CRM – PHI.
4. M. Peeru Mohamed – CRM - Vikas

COURSE CODE	COURSE TITLE	L	T	P	C
20161DSC64A	TALLY PRIME	3	0	0	2

AIM

To develop the knowledge regarding the concepts of financial accounting in students that is used for learning to maintain accounts.

OBJECTIVES

To impart practical knowledge in TALLY and ensure that finance for the company is always in order and is correct at all given points of time.

UNIT-I

TALLY – Introduction to Tally Prime – Difference between Tally Prime and Tally ERP9
– New Features in Tally Prime

UNIT-II

Company Creation – Chart of Accounts

UNIT-III

Inventory Master and Inventory Vouchers in Tally

UNIT-IV

Payroll Master in Tally

UNIT-V

Reports in Tally

OUTCOME

Students are able to get placements in different offices as well as companies in Accounts departments.

REFERENCE BOOKS

1. Learn Tally Prime – Gaurav Agarwal

Course Code	Course Title	L	T	P	C
20114OEC	OPEN ELECTIVE: FOOD AND ADULTERATION	4	0	0	2

UNIT-I INTRODUCTION TO FOOD CHEMISTRY

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

UNIT- II FOOD PIGMENTS

Introduction- classification, types of food pigments- chlorophyll, Carotenoids, Anthocyanins, Flavanoids.

UNIT- III FOOD PRESERVATION

Introduction- Importance, principle and Types. High and low temperature preservation- Pasteurization- Sterilization- Canning- Freezing- Refrigeration.

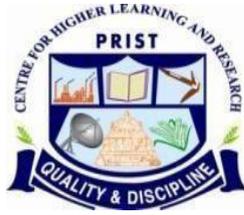
UNIT- IV FOOD ADDITIVES

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent,

sweeteners, humectants and anti
-caking agents, coloring and flavoring substance.

UNIT-V FOOD ADULTERATION

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices, Grains, Coffee, Tea, Oil fats, Food colours and Milk. Health hazards and risks.



PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY (PRIST)
(Institution Deemed to be University U/S 3 of UGC Act 1956)
THANJAVUR – 613 403



MASTER OF BUSINESS ADMINISTRATION
CURRICULUM
(2020 onwards)

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching-research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students' understanding of and through research. Curricula can be:

Research–Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research–Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research–Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research-Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed

ResearchLevel 2: Bounded

ResearchLevel 3: Societal

ResearchLevel 4: Self actuated

ResearchLevel5:OpenResearch

TakingintoconsiderationtheabovementionedfactsinrespectofintegratingresearchintotheMBA2020 Curriculum,thefollowing ResearchSkillBased Coursesareintroducedinthe curriculum.

Sem	RSB Courses	Credits
I	ResearchLedSeminar	1
II	ResearchMethodology	3
II	ParticipationinBoundedResearch	2
III	ParticipationinSocietalResearch	4
IV	ProjectWork	12

Blueprintforassessmentofstudent'sperformanceinResearchLedSeminarCourse

- **InternalAssessment:** **40Marks**
 - SeminarReport(UG)/ConceptNote(PG) :5X4=20Marks
 - SeminarReviewPresentation :10Marks
 - Literature Survey :10Marks
- **SemExamination :** **60Marks**
(EssaytypeQuestions setbytheconcernedresourcepersons)

Blueprintforassessmentofstudent'sperformanceinSocioTechnicalProject

- **ContinuousInternalAssessmentthroughReviews:** **40Marks**

● Review I	:	10Marks	
● Review II	:	10Marks	
● Review III	:	20 Marks	
● Evaluation of Socio Technical Practicum Final Report:			40Marks
● Viva-Voce Examination:			20Marks
● Total:			100Marks

Blueprint for assessment of student's performance in Research Methodology

Courses Continuous Internal Assessment: 20Marks

● Research Tools(Lab):	10Marks
● Tutorial:	10Marks

Model Paper Writing: 40Marks

● Abstract:	5 Marks
● Introduction:	10Marks
● Discussion:	10Marks
● Review of Literature:	5Marks
● Presentation:	10 Marks

Sem Examination: 40Marks

Total:

100Marks

MASTER OF BUSINESS ADMINISTRATION CURRICULUM (2020 ONWARDS)

PRIST SCHOOL OF BUSINESS - PG MBA - REGULATION 2020

Sem no	Paper No	Subject Code	Subject Title	L	T	P	C
I	1	20260SEC11	Management Concepts	5	0	0	3
I	2	20260SEC12	Organizational Behaviour	5	0	0	3
I	3	20260SEC13	Accounting for Managers	5	0	0	4
I	4	20260SEC14	Economics for Managers	5	0	0	3
I	5	20260SEC15	Legal Aspects of Business	5	0	0	3
I	6	20260SEC16	Statistics for Managers	5	0	0	4
I	7	20220SEC01	Managerial Skill Development- Lab	0	0	1	1
I	8	20260RLC18	Research Led Seminar	0	0	0	1
			Total	30	0	1	22
II	1	20260SEC21	Financial Management	5	0	0	4
II	2	20260SEC22	Human Resources Management	5	0	0	3
II	3	20260SEC23	Marketing Management	5	0	0	3
II	4	20260SEC24	Production & Operations Management	5	0	0	3
II	5	20260RMC25	Research Methodology	5	0	0	3
II	6	20260SEC26	Strategic Management	5	0	0	3
II	7	202SSCAS	Technical, General Aptitude and Skill set Development	0	0	2	2
II	8	20260BRC28	Participation in Bounded Research	0	0	0	2
			Total	30	0	1	23
III	1	20260SEC31	International Business Environment	6	0	0	3
III	2	20260SEC32	Operations Research	6	0	0	4
III	3	20260SRC33	Design/Socio-Technical Project	0	0	0	2
III	4	20260E-3-	Elective1	4	0	0	3
III	5	20260E-3-	Elective2	4	0	0	3
III	6	20260E-3-	Elective3	4	0	0	3
III	7	20260E-3-	Elective4	4	0	0	3
III	8	20260E-3-	Elective5	4	0	0	3
			Total	30	0	0	24
IV	1	20260SEC41	Entrepreneurial Development	5	0	0	4
IV	2	20260E-4-	Elective6	5	0	0	3
IV	3	20260E-4-	Elective7	5	0	0	3
IV	4	20260PRW44	Project Work	0	0	0	10
IV	5	202SSCIM	Interview Skills Training and Mock Test	0	0	0	2
IV	6	20260PEE	Programme Exit Exam	0	0	0	2
			Total	15	0	0	24

Total Credits

93

III Sem (Marketing)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EA33	Consumer Behavior	3
III	2	20260EA34	Integrated Marketing Communication	3
III	3	20260EA35	Brand Management	3
III	4	20260EA36	Retail Management	3
III	5	20260EA37	Sales Management	3
III	6	20260EA38	Services Marketing	3
III	7	20260EA39	Industrial Marketing	3
III Sem (Human Resource)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EB33	Knowledge Management	3
III	2	20260EB34	Organizational Development & Change management	3
III	3	20260EB35	Performance Management	3
III	4	20260EB36	Labor Legislations	3
III	5	20260EB37	Compensation Reward Management	3
III	6	20260EB38	Cross Culture Management	3
III	7	20260EB39	Conflict and Negotiation Management	3
III Sem (Finance)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EC33	Security Analysis and Portfolio Management	3
III	2	20260EC34	Derivatives Management	3
III	3	20260EC35	Project Finance	3
III	4	20260EC36	Financial Services and Institutions	3
III	5	20260EC37	International Finance	3
III	6	20260EC38	Insurance and Risk Management	3
III	7	20260EC39	Corporate Finance	3
III Sem (Logistics and Supply chain)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EE33	Purchasing and Procurement Management	3
III	2	20260EE34	Material Management	3
III	3	20260EE35	Inventory Management	3
III	4	20260EE36	Supply Chain Management	3
III	5	20260EE37	Logistics Management	3
III	6	20260EE38	Custom House Practice And Legalities	3
III	7	20260EE39	Export Trade And Documentation	3
III Sem (Hospital Management)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EH33	Management Of Hospital Services	3
III	2	20260EH34	Operations Management In Health Care	3
III	3	20260EH35	Marketing Management Of Hospital And Health Care Services	3
III	4	20260EH36	Community Health and Management of National Health Programmes	3
III	5	20260EH37	Management of Clinical and Super Specialty Services in Hospitals	3
III	6	20260EH38	Patient Care Management	3
III	7	20260EH39	Health Related Laws and Ethics	3
III Sem (Productions and Operations)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260ED33	Project Management	3
III	2	20260ED34	Planning and control of operations	3

III	3	20260ED35	Technology Management	3
III	4	20260ED36	Logistics Management	3
III	5	20260ED37	Supply Chain Management	3
III	6	20260ED38	Business Process Reengineering	3
III	7	20260ED39	Material Management	3
III Sem (International Business)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EF33	International Marketing	3
III	2	20260EF34	International Human Resource Management	3
III	3	20260EF35	Cross Cultural Management	3
III	4	20260EF36	Global Logistics and Supply Chain Management	3
III	5	20260EF37	International Trade Procedures and Documentation	3
III	6	20260EF38	International Strategic Management	3
III	7	20260EF39	Global Business Ethics and Corporate Governance	3
III Sem (Systems)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EG33	Software Engineering	3
III	2	20260EG34	Software Project Management	3
III	3	20260EG35	Relational Database Management Systems	3
III	4	20260EG36	E-Business Technology Management	3
III	5	20260EG37	Data Warehousing & Data Mining	3
III	6	20260EG38	Knowledge Management	3
III	7	20260EG39	Enterprise Resource Planning	3
III Sem (Tourism)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EI33	Tourism Principles ,Policies and Practices	3
III	2	20260EI34	Tourism Products of India	3
III	3	20260EI35	Destination Planning and development	3
III	4	20260EI36	Travel agency and Tour operations	3
III	5	20260EI37	Hospitality Management	3
III	6	20260EI38	Indian culture and Heritage	3
III	7	20260EI39	Tourism Marketing	3
III Sem (Agribusiness)				
Sem	Paper no	Subject code	Subtitle	Credit
III	1	20260EJ33	Agribusiness Environment and Policy	3
III	2	20260EJ34	Agricultural Marketing Management	3
III	3	20260EJ35	Farm Business Management	3
III	4	20260EJ36	Management of Agribusiness Cooperatives	3
III	5	20260EJ37	Food Retail Management	3
III	6	20260EJ38	Management of Agricultural Input Marketing	3
III	7	20260EJ39	Agri Supply Chain Management	3
IV Sem (Marketing)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EA42	Customer Relationship Management	3
IV	2	20260EA43	International Marketing	3
IV	3	20260EA44	Rural Marketing	3
IV Sem (Human Resource)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EB42	Industrial Relation	3
IV	2	20260EB43	Training & Development	3

IV	3	20260EB44	Talent Management	3
IVSem(Finance)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EC42	Micro Finance	3
IV	2	20260EC43	Strategic Financial Management	3
IV	3	20260EC44	Merchant Banking and Financial Services	3
IV Sem (Logistics and Supply chain)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EE42	Quality Management	3
IV	2	20260EE43	Air Cargo Logistics Management	3
IV	3	20260EE44	Shipping And Ocean Freight Logistics Management	3
IV Sem (Hospital Management)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EH42	Medical Tourism	3
IV	2	20260EH43	Hospital Architecture, Planning, Design and Maintenance	3
IV	3	20260EH43	Hospital Waste Management	3
IV Sem (Productions and Operations)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260ED42	Maintenance Management	3
IV	2	20260ED43	Service and Operation Management	3
IV	3	20260ED44	Product Design	3
IV Sem (International Business)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EF42	Management Of International Developmental Organizations	3
IV	2	20260EF43	Merger and Acquisitions	3
IV	3	20260EF44	International Financial Management	3
IV Sem (Systems)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EG42	Information Storage & Management	3
IV	2	20260EG43	Cloud Computing	3
IV	3	20260EG44	Decision Support System And Intelligent Systems	3
IV Sem (Tourism)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EI42	Ecotourism	3
IV	2	20260EI43	Event Management	3
IV	3	20260EI44	E-Tourism	3
IVSem (Agribusiness)				
Sem	Paper no	Subject code	Subtitle	Credit
IV	1	20260EJ42	Agriculture Economics	3
IV	2	20260EJ43	Agricultural and Micro-Finance	3
IV	3	20260EJ44	New Trends and Developing Agri-Sector	3

SEMESTER-I

SEM	ONE	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC11		4	0	0	3

MANAGEMENT CONCEPTS

COURSE OBJECTIVE: To familiarize the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms.

COURSE OUTCOME: Gives exposure to the practice of management in contemporary organizations from a conceptual, analytical perspective. Create ability to analyze and understand management as well as exploring and developing their own personal philosophy of management.

UNIT I INTRODUCTION TO MANAGEMENT Organization-Management-Role of managers- Evolution of management thought- Organization and the environmental factors- Managing globally- Strategies for International business.

UNIT II PLANNING Nature and purpose of planning- Planning process- Types of plans- Objectives- Managing by Objective (MBO) strategies- Types of strategies – Policies – Decision Making- Types of decision making process- Rational decision making process- Decision making under different conditions.

UNIT III ORGANISING Nature and purpose of organizing- Organization structure- Formal and informal groups/organization- Line and staff authority- Departmentation- Span of control- Centralization and decentralization- Delegation of authority- Staffing- Selection and Recruitment- Orientation- Career development- Career stages- Training- Performance appraisal

UNIT IV DIRECTING Managing people- Communication- Hurdles to effective communication- Organization culture Elements and types of culture- Managing cultural diversity.

UNIT V CONTROLLING Process of controlling- Types of control- Budgetary and non-budgetary control techniques Managing productivity- Cost control- Purchase control- Maintenance control- Quality control Planning operations.

Employability

TEXT/REFERENCES

1. Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, 9th edition, 2012.
2. Samuel C. Certo and Tervis Certo, Modern management: concepts and skills, Pearson education, 12th edition, 2012.
3. Harold Koontz and Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 9th edition, Tata McGraw-Hill Education, 2012.
4. Charles W. L. Hill and Steven L. McShane, Principles of Management, McGraw Hill Education, Special Indian Edition, 2007.

SEM	ONE	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC12		4	0	0	3

ORGANIZATIONAL BEHAVIOUR

COURSE OBJECTIVE: To provide an overview of the theories and practices in organizational behavior in individual, group and organizational level.

COURSE OUTCOME: Students will have a better understanding of human behavior in organization. They will know the framework for managing individual and group performance.

UNIT I FOCUS AND PURPOSE Definition, need and importance of organizational behaviour – Nature and scope – Framework – Organizational behaviour models.

UNIT II INDIVIDUAL BEHAVIOUR Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification. Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception Impression Management. Motivation – Importance – Types – Effect on work behavior.

UNIT III GROUP BEHAVIOUR Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Teambuilding – Interpersonal relations – Communication – Control.

UNIT IV LEADERSHIP AND POWER Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT V DYNAMICS OF ORGANIZATIONAL BEHAVIOUR Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives – Organizational effectiveness Developing Gender sensitive workplace.

Employability

TEXT/REFERENCES

1. Stephen P. Robins, Organisational Behavior, PHI Learning/Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.

SEM	ONE	NATURE	CORE	L	P	T	C
COURSE CODE		20260SEC13		4	0	1	4

ACCOUNTING FOR MANAGERS

COURSE OBJECTIVE: To acquaint the students with the fundamental principles of financial, cost & Management Accounting. Enable the student to take decisions using management accounting tools and to expose the student to various concepts and principles of accounting for making efficient decisions.

COURSE OUTCOME: Student would be able to know the accounting systems carried out in an organization and its utilization for the betterment of an organization through analysis of financial statements and cash flow analysis. Student would benefit by being able to study, understand and analyze financial statements.

UNIT – I Financial Accounting: Introduction to Financial, Cost and Management Accounting- Generally accepted accounting principles, Preparation of Journal, Ledger and Trial Balance.

UNIT–II Company Accounts: Meaning of Company- Maintenance of Books of Account- Statutory Books - Preparation of Final Accounts – Provisions relating to preparation of final accounts – Profit and loss account and Balance sheet

Introduction- types of shares: Issue of Shares at par, Premium and at Discount - Forfeiture and Reissue of Shares- Rights issue- Recording of transactions relating to issue of shares.

Issue and Redemption of Debentures - Redemption out of profits – sinking fund method / Recording of transactions relating to issue and redemption of debentures, Underwriting of Issue of Shares (Simple Problems)

UNIT – III Management Accounting: Analysis of Financial Statements – Ratios , Comparative Statement, Common Size Balance Sheet, Cash flow Statement, Fund Flow Statement , Trend Analysis.

UNIT – IV Cost Accounting: Cost Accounts - Classification of manufacturing costs - Accounting for manufacturing costs. Cost Accounting Systems: Job order costing- Process costing- Activity Based Costing- Costing and the value chain- Target costing- Marginal costing including decision making

UNIT – V Budgeting and Budgetary control: Budgetary Control – Meaning and Concepts - Preparation of Various Budgets, Variance Analysis – Material, Labour and Overhead.
Skill Development and Employability

TEXT/REFERENCES

M. Y. Khan & P. K. Jain, Management Accounting, Tata McGraw Hill, 2004.

R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi, 2008.

SEM	ONE	NATURE	CORE	L	P	T	C
COURSECODE	20260SEC14			4	0	0	3

ECONOMICS FOR MANAGERS

COURSE OBJECTIVE: To make the students aware of the various economic theories and principles - To equip them with the required tools and techniques for improving their decision making skills.

COURSE OUTCOME: The student must have micro and macro-economic perspective to understand the underpinning of management.

UNIT – I Nature and scope of Managerial Economics- Managerial Economics and other disciplines – Basic concepts, Tools and Techniques of analysis – The Role of Managerial Economists – Analysis of Demand and Supply.

UNIT – II Theory Production Functions - Laws of Production – Economies of scale – Cost Concepts - Cost-Output Relationship – Revenue Analysis- Objectives of the firm – Breakeven analysis – Uses

UNIT – III Market Morphology – Monopolistic Competition – Features – Product Differentiation – Sources of Product differentiation – Equilibrium output and price determination of a firm – Selling cost Vs Production cost – Oligopoly – Features – kinked demand curve – Behavior of oligopolistic market – Price leadership, Price Wars, collusion, cartel and market share.

UNIT-IV Pricing Policies – Objectives - Pricing Methods

UNIT – V Market Economy – Market mechanism – Government and Market Economy – Failures of Market Mechanism - Need for Government intervention - Cases of state intervention- role of Government – Tools of Intervention – Fiscal and Monetary policy – Redefining the role of Government in a mixed economy – Knowledge Based economy – Features of K-Economy.

Skill Development

TEXT/REFERENCES

1. Varshney, R.L., and Maheswari, K.L., Managerial Economics., Sultan Chand & Sons.
2. D.M Mithani., Managerial Economics – Theory and Applications, Edition 2014, Himalaya Publishing House.
3. Gupta G.S., Managerial Economics, Tata McGraw Hill.
4. Riggs, J.L., Managerial Economics, McGraw Hill.
5. Peterson, H.C and W.C. Lewis, Managerial Economics, Prentice-Hall of India.
6. Datt & Sundharam “Indian Economy”, Gaurav Dutt & Ashwini Mahajan., 71st Edition S Chand

SEM	ONE	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC15		4	0	0	3

LEGAL ASPECTS OF BUSINESS

COURSE OBJECTIVE: To create the knowledge of Legal perspective and its practice to improvise the business.

COURSE OUTCOME: Legal insight will be established in the business practices according to the situation of changing environment.

UNIT - I: The Contract Act, 1871 Nature and classification of contracts - Essential elements of a valid contract - Offer and Acceptance - Consideration - Capacities of Parties - Provisions relating to free consent, void agreements - Provisions relating to performance and discharge of contract - Breach of contract - Meaning and remedies.

UNIT - II: Contract Act, 1872 Contracts of Indemnity - Meaning, nature - Right of Indemnity Holder and Indemnifier - Contracts of Guarantee - Meaning, Nature and Features - Types of Guarantee - Provisions relating to various types of Guarantee - Agency - Agent and Principal - Creation of Agency - Classification of Agents - Relationship between Principal and Agent - Rights, Duties and Liabilities of Agent and Principal - Termination of Agency

UNIT - III: Sales of Goods Act, 1930 Contract for Sale of Goods - Meaning - Essentials of a Contract of Sale - Formalities of a Contract of sale - Provisions relating to conditions and Warranties - Provisions relating to performance of Contract of Sale - Rights of Unpaid - Seller - Rules as to delivery of goods - Patents Act; Conceptual understanding of patents, copyrights, trademarks and designs

UNIT - IV: The Negotiable Instruments Act, 1881 Negotiable Instruments - Meaning, Characteristics, Types, Parties - Holder and holder in Due Course - Negotiation and Types of Endorsements - Dishonour of Negotiable Instrument - Noting and Protest - Liability of parties on Negotiable Instrument.

UNIT - V: The Companies Act, 1956 and The Information Technology Act, 2000 Company - Definition, Meaning, Features and Types of companies - Incorporation of a company - Memorandum of Association, Articles of Association and Prospectus - the information technology act, 2000; Digital Signature - Digital Signature Certificate - Electronic Governance - Electronic Records - Certifying Authorities - Penalty & Adjudication.

Skill Development

TEXT/REFERENCES

1. Elements of Mercantile Law - N.D. Kapoor.
2. Mercantile Law - Maheswari & Maheswari.
3. Mercantile Law - S.M. Shukla.
4. Pathak and Akhileshwar, "Legal Aspects for Business", 3rd Edition, Tata McGraw - Hill Publishing Company Ltd, 2007.
5. Tulsian, "Business Law", 2nd Edition, Tata McGraw - Hill Publishing Company Ltd., 2000.
6. Goel, "Business Law", Wiley India Pvt. Ltd, 2007.

SEM	ONE	NATURE	CORE	L	P	T	C
COURSECODE	20260SEC16			4	0	1	4

STATISTICS FORMANAGERS

COURSE OBJECTIVE: This course mainly deals with the use of Statistical concepts in the resolution of managerial decision problems. As such the course will deal not only with some of the theoretical concepts in Statistics but will also be concerned with their application.

COURSE OUTCOME: Students will achieve statistical literacy and will be able to find ways to move beyond the-what of statistics to the how and why of statistics.

UNIT - I Fundamental of Statistics Statistics – Definition, Types. Types of variables – Organising data - Descriptive Statistics – measures of central tendency – measures of dispersion; Skewness & Kurtosis – Frequency distribution – Histograms – Polygons – Definition of random variable.

UNIT - II Fundamentals of Probability Basic definitions and rules for probability, conditional probability independence of events, Baye's theorem, and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions.

UNIT - III Sampling Distribution and Estimation Introduction to Sampling Distributions - Sampling Distribution of Sample Mean and Sample Proportion - Application of Central Limit Theorem - Sampling Techniques - Estimation and Confidence Intervals - Point and Confidence Interval Estimates for Population Parameters of Large-Sample and Small Samples - Determining the Sample Size.

EMPLOYABILITY

UNIT - IV Testing of Hypothesis Hypothesis Testing - General Procedure for Hypothesis Testing - Errors in Hypothesis Testing – One Sample and Two Sample Tests for Means and Proportions of Large Samples (Z-Test) - One Sample and Two Sample Tests for Means of Small Samples (T-Test), (F-test) for two sample standard deviations. ANOVA one and two way classification.

UNIT - V Non-Parametric Methods The Chi-Square Test - Statistic - Applications of Chi-Square Tests - Test of Independence of Attributes - Goodness of Fit - Theory of Correlation and Regression: Meaning of Correlation and regression – Principles of Least squares – Simple Linear Regression – Simple correlation – Co-efficient – Rank Correlation Time Series Analysis - Variations in Time Series.

TEXT/REFERENCES

1. Richard I. Levin and David S. Rubin, "Statistics for Management", 7th Edition, Pearson Education, 1998. / Prentice Hall of India Pvt. Ltd, 2001.
2. T.N. Srivastava and Shailaja Rego, "Statistics for Management", 1st Edition, Tata McGraw-Hill Publishing Company Ltd., 2007.
3. S.P. Gupta, "Statistical Methods", 7th Edition, S. Chand and Co. Ltd., 2004.
4. Anderson and Skini, "Statistics for Business and Economics", 9th Edition, Cengage Learning
5. Mathematics for Managers - M. Raghavachari, TMH
6. Statistics for Management - Levin et al (PHI) 3. Business Statistics - Saha (Central) Introduction to Statistics for Business - John Fraund.

SEM	ONE	NATURE	PRACTICAL	L	P	T	C
COURSECODE	20220SEC01			0	2	0	1

MANAGERIALSKILLDEVELOPMENT

COURSEOBJECTIVE: This course will focus on overall Personality Development of students by enhancing their communication skills, shaping their attitudes and behaviours and ultimately preparing them for corporate roles.

COURSE OUTCOME: Learners are able to speak confidently and effortlessly in different contexts – informal and formal. They can be think on feet’ even in difficult circumstances. To get into the habit of express themselves in different genres of writing from creative to critical to factual writing. The student will be able to manage communication in the organization and develop interpersonal relationships.

UNITI: Self introduction – News Reading – Story Telling – Etiquettes for Managers – Reviews of Articles, Movies and Books

UNITII: Role Play – Debate – Group Discussions – Paper Presentation – Mock Interview

UNITIII: Corporate Writing, Creative Writing, Report Writing, Preparing Press Notes.

UNITIV: Case Studies – Analyzing and presenting Cases, Poster Making, Framing Advertisements, Slogans, Captions.

UNITV: Use of Computer & Technology (MS Word, Powerpoint) (Using Internet as a tool for effective Management)

EMPLOYABILITY

SEMESTER-II

SEM	TWO	NATURE	CORE	L	P	T	C
COURSECODE	20260SEC21			3	0	1	4

FINANCIALMANAGEMENT

COURSEOBJECTIVE::Facilitate student to understand the operational nuances of a Finance Manager
Comprehend the technique of making decisions related to finance function

COURSEOUTCOME:Learners can recall and understand Indian financial systems. Evaluate the investments projects and companies. Prepare capital budget and appropriations. Decide upon the capital structure and working capital budgeting decisions. Take decision on higher dividend payout or lower dividend payout.

UNIT – I: Introduction of Financial Management: Concept of Finance, Corporate Finance, Finance Functions and other functions. Structures of the Financial System. Financial Management – Meaning, functions and Objectives of Financial Management- Financial Planning and Forecasting of short term and long term – time value of money – risk and return.

UNIT – II: Financing Decision Sources of funds - Relative merits and demerits, Capitalization - Under Capitalization and Over Capitalization- Capital Structure - theories of capital structure - Factors affecting capital structure - Financing decision in practice - leverage - Operating, Financial and combined leverage - Cost of capital- Cost of individual components of capital- Weighted Average cost of capital.

UNIT – III: Investment Decision Nature and Significance of Investment Decision - Estimation of cash flows - Capital Budgeting Process - techniques of investment appraisal: Pay back period; Accounting Rate of Return - DCF Techniques - Net present value, Profitability Index and Internal Rate of Return - Investment appraisal practices in Indian companies.

UNIT – IV: Working Capital Decision Meaning- Nature of working capital- Classification and significance of working capital - financing of Working capital - Component of working capital, Cash, Short-term marketable securities- Management of Cash and Receivables

UNIT – V: Dividend Decision Management of Profits - Meaning and Significance - Theories of Dividend - Determinants of dividend - Dividend Policy - Dividend policies in practice - Legal aspects of Dividends – Bonus shares – stock splits.

Employability

TEXT/REFERENCES

1. M. Y. Khan and P. K. Jain Financial management, Text, Problems and cases Tata McGraw Hill, 6th edition, 2011.
 2. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2012.
- ### REFERENCES
1. Aswat Damodaran, Corporate Finance Theory and practice, John Wiley & Sons, 2011.
 2. James C. Vanhorne – Fundamentals of Financial Management – PHI Learning, 11th Edition, 2012.
 3. Brigham, Ehrhardt, Financial Management Theory and Practice, 12th edition, Cengage Learning 2010.
 4. Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.
 5. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011

SEM	TWO	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC22		4	0	0	3

HUMAN RESOURCE MANAGEMENT

COURSE OBJECTIVE: To provide knowledge about management issues related to staffing, training, performance, compensation, human factors consideration and compliance with human resource requirements.

COURSE OUTCOME: Understanding of importance of Human Resource Management Understanding of concepts and practices of Human Resource Management Designing strategies in Human Resource Management Ability to take up activities in Human Resource Management. Basic knowledge about prevailing legislations related to labour

UNIT-I: HR Roles and Functions Human Resource Management-Introduction and Importance-Evolution-Difference between Personnel Management and HRM-HR functions-Structure of HR Department-Role, Duties and responsibilities of HR manager-HRDS System-HR Strategies and organisational Strategies.

UNIT - II: Human Resources planning and recruitment Objectives-Importance-HRP Process-Manpower Estimation-Job analysis-Job Description-Job Specification - Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees-merit rating-promotion-transfers-job enlargement-job enrichment-job rotation.

UNIT-III: Training and Development and performance appraisal Training and Development-Training Process and Methodology - Need and objectives - Training procedure - Methods of Training -Evaluation of Training programmes Performance Management System - Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors-Competency management-Career Planning.

UNIT - IV: Compensation Management Concepts and Components-Compensation Plan - Reward - Motivation - job evaluation - Fringe benefits and services - Employee Welfare - retirement /Separation - Kind of Retirement-Resignation, Discharge, Dismissal, Suspension, Retirement, Layoff, Voluntary Retirement/Separation Schemes, Golden handshake.

UNIT - V: Industrial Relations Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management-time management-Corporate Social Responsibility.

Employability

TEXT/REFERENCES

1. Decenzo & Robbins, Personnel/Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd. Anne-wil Harzing & Joris Van Ruvoss eveltd (eds.), International Human Resource Management - Sage Publications, New Delhi.
2. Biswajeet Patanayak, Human Resource Management, PHI, New Delhi
3. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.
4. Rudrabasavaraj, Dynamics of Personnel Admn. Himalaya Publishing House, Mumbai
5. Personnel Management-C. B M Matoria
6. Human Resources Management-Ashwathappa

SEM	TWO	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC23		4	0	0	3

MARKETINGMANAGEMENT

COURSEOBJECTIVE: To understand fundamental concepts of Marketing in Modern Marketing Practices

COURSEOUTCOME: knowledge of analytical skills in solving marketing related problems, awareness of marketing management process

UNIT I Marketing: Meaning – Concept & its types – Functions and organisation – Marketing Planning – Core concepts of marketing (such as Need, Want, Demand, Customer Value, Exchange, Customer & Consumer, Customer Satisfaction, Customer Delight, Customer Loyalty, Marketing v/s Market, Selling versus Marketing). Concept of Marketing Myopia - Marketing Segmentation and Consumer Behaviour – Marketing Research

UNIT II Product Characteristics – Classification – Product Differentiation – Product Hierarchy – Co-Branding – Packaging – Labeling – Warranties & Guarantees – New Product Development

UNIT III Understanding Pricing – Setting the Price – Types of Pricing Strategies – Initiating & Responding to the Price Changes

UNIT IV Role of Marketing Communication – Components of Promotion (Advertising, Sales Promotion, Personal Selling, Public Relations – Basic Concepts), Direct Marketing (Direct Mail, Catalogue, TeleMarketing),

UNIT V Importance of Marketing Channels – Functions – Channel Design – Channel Management – E-Commerce – Marketing Practices – Retailing – Types & Recent Trends – Wholesaling – Market Logistics – Managing Sales Force.

Employability

TEXT/REFERENCES

1. Philip Kotler, Kevin Lane, Abraham Koshy - Marketing Management – A South Asian Perspective - Pearson/Prentice Hall India Ltd
2. Rajan Saxena – Marketing Management - Tata McGraw Hill
3. Ramaswamy & Namakumary - Marketing Management - Global Perspective - Indian Context - MacMillan India Ltd

SEM	TWO	NATURE	CORE	L	P	T	C
COURSE CODE	20260SEC24			3	0	1	3

PRODUCTION AND OPERATIONS MANAGEMENT

COURSE OBJECTIVE: To provide a broad introduction to the field of production and operations management and explain the concepts, strategies, tools and techniques for managing the transformation process that can lead to competitive advantage.

COURSE OUTCOME: The students would have learned about various concepts related to the production and operations management. Also understood the decision role and responsibilities of operations function vis-à-vis other functions in an organization.

UNIT-I: INTRODUCTION OF PRODUCTION AND OPERATIONS MANAGEMENT Production & Operations Management – Meaning, Scope, Functions, Relationship between POM & other functional areas of Management – Effect of Time Element on POM. Classification of Production Systems – Intermittent, Jobshop, Batch, Continuous, Flow and Mass Production Systems.

UNIT-II: PRODUCTION PLANNING AND CONTROL Production Planning & Control – Preplanning – Fore Casting – Scheduling – Dispatching – Routing – Expediting – Plant Location – Factors Influencing Plant Location, Importance of Environmental Health & Safety factors in deciding the location of plant – Cost Factor – Plant Layout – Principles, Flow Patterns, Types of Plant Layout – Capacity Planning – Types of Capacity, Capacity Decision, Capacity Planning Strategies – Manufacturing Model, P & Q Systems, MRP-I & MRP-II.

UNIT-III: DESIGN OF PRODUCT, PROCESS AND WORK SYSTEMS Product Design – Influencing factors, Approaches, Legal, Ethical and Environmental issues. Process – Planning, Selection, Strategy, Major Decisions. Work Study – Objectives, Procedure. Method Study and Motion Study. Work Measurement and Productivity – Measuring Productivity and Methods to improve productivity.

UNIT-IV: SCHEDULING AND PROJECT MANAGEMENT Project Management – Scheduling Techniques, PERT, CPM; Scheduling – work centers – nature, importance; Priority rules and techniques, shop floor control; Flow shop scheduling – Johnson’s Algorithm – Gantt charts; personnel scheduling in services.

UNIT-V: MATERIALS MANAGEMENT Materials Management, Components of Materials Management – Materials Planning, Inventory Control, Purchase Management, Stores Management. Inventory Management – Inventory Decisions, Models of Inventory – ABC Analysis, XYZ Analysis and JIT.

Employability

TEXT/REFERENCES

1. Operations Management For Competitive Advantage, Chase, Jacobs, Aquilano, Agarwal, 11th Edition, TMH.
2. Production And Operations Management, S.N.Chary, 3rd Edition, TMH
3. Operations Management, Russell, Taylor Iii, 4th Edition, PHI
4. Production And Operations Management, Chunawalla, Patel, HPH
5. Production And Operations Management Concepts, Models, Behavior, Adam Jr. Ebert, PHI.
6. Modern Production/Operations Management, Buffa, Sarin, 8th Edition, Wiley

SEM	TWO	NATURE	CORE	L	P	T	C
COURSECODE		20260RMC25		3	0	1	3

RESEARCH METHODOLOGY

AIM: To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES: To understand the approaches towards and constraints in good research. To identify various statistical tools used in research methodology. To appreciate and compose the manuscript for publication

OUTCOME: Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES: Research Methodology course in UG level or equivalent knowledge.

Unit I: INTRODUCTION Research – Importance and its types – research approaches – process – problem formulation – development of hypothesis – Research design – determining the sample design – collecting data – analysis of data – identifying research problem.

Unit II: Measurement and its techniques Measurement in research and its problems – meaning of scaling – tests of sound measurement – types of scaling- Techniques of measurement – Attitude scales – summated rating scale – Equal appearing Interview scale– cumulative scale – Rating scale – Scale constructing Techniques- Timeseries analysis- Projection Techniques

Unit III: DATA COLLECTION AND HYPOTHESIS Classification of data – sources of data – collection of primary and secondary data – Questionnaire method – Guidelines for Questionnaire design – Interview technique – Observation techniques – Processing of data – Editing – Coding – Tabulation – Interpretation of data – Formulation of hypothesis – Test of hypothesis.

Unit IV: Statistical Techniques Statistical Techniques- Quantitative and qualitative techniques- Measures of Central Tendency – Arithmetic mean, Median and Mode- Standard deviation – Karl Pearson's coefficient of correlation – Regression – Chi-square test – conditions for applying chi-square test – ANOVA – Spearman's Rank Correlation.

Unit V : INTERPRETATION AND REPORT WRITING Interpretation – Techniques of Interpretation – Significance of Report Writing- Different steps in writing report – layout of research report – types – oral presentation – mechanics of writing a research report – precautions for writing research reports – Role of computers in Research.

Employability

Recommended Textbook: 1. Business Research methods By Dr. T.N. Srivastava and Mrs. Shailaja Rego – Tata Mcgraw Hill. Co Chennai – Email: mark_pani@mcgraw.hill.com

1. Business Research methods, Alan Bryman and Emmabell – Oxford University press. Chennai. Email :v.anand@oup
2. Research methodology, By R. Panneer Selvam, philearning India PVT Ltd., New Delhi. Email: phi@phindia.com
3. Academic writing, A guide for management students and Researchers, By Mathukutty M. Monippally and Badrinarayanan Shankar Pawar – www.sagepublications.com
4. Research methods Indian Edition By Donald H. Mcburney and Theresa – Cengage (learning. Email: sriram.b@cengage.com)

SEM	TWO	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC26		4	0	0	3

STRATEGICMANAGEMENT

COURSEOBJECTIVE:Toprovideanintegratedviewofthefunctionalareasandtoacquaintthestudentwiththestrategicmanagementprocess.Focusestocriticallyexaminethemanagementoftheentireenterprise fromtheTopManagementviewpoints.

COURSE OUTCOME: Create knowledge and understanding of management policies and strategies within achanging context to meet stakeholderinterests information systems to learn from failure key tools andtechniquesfortheanalysisanddesignofinformationsystems,includingtheirhumanandorganisationalas wellastechincal aspects.

UNIT-I-INTRODUCTIONTOSTRATEGICMANAGEMENTStrategicManagementandCompetitiveness- Technology and Technology– Stakeholders in business – Vision, Mission and Purpose –Business definition, Objectives and Goals – Strategic Business unit (SBD); Functional level strategies - CorporateGovernanceandSocialresponsibility

UNIT-IIENVIRONMENTALANALYSISTheExternalEnvironment:Opportunities,Threats,CompetitionandCompe titorAnalysis.ExternalEnvironmentalAnalysis,SegmentsoftheExternalEnvironment,Porters5ForceModel, The internal Environment: Resource, Capabilities, Competencies andCompetiveadvantages.Analyzinginternalorganization-BuildingCoreCompetencies- ValueChainAnalysis,Outsourcing.

UNIT-III:STRATEGIESThe generic strategic alternatives– Stability,Expansion,RetrenchmentandCombination strategies - Business level strategy- Strategy in the Global Environment-Corporate Strategy-Vertical Integration-Diversification and Strategic Alliances- Building and Restructuring the corporation-Strategic analysis and choice - Environmental Threatand Opportunity Profile (ETOP) - OrganizationalCapability Profile - Strategic Advantage Profile - Corporate Portfolio Analysis - SWOT Analysis - GAPAnalysis-McKinsey's7sFramework-GE 9CellModel–Distinctivecompetitiveness- Selectionofmatrix -BalanceScoreCard

UNIT-IV STRATEGY IMPLEMENTATION & EVALUATION The implementation process, Resourceallocation, Designing organisational structure-Designing Strategic Control Systems- Matching structure andcontroltostrategy-ImplementingStrategicchange–Politics-PowerandConflict- Techniquesofstrategievaluation&control-casestudy

UNIT-VSTRUCTUREANDCONTROLSSstructureandControlswithOrganizations- OrganizationalStructureandcontrols,EvolutionaryPatternsofstrategyandorganizationalstructure.LeadershipImp licationsforStrategy-EntrepreneurialImplicationsforStrategy– FunctionalStrategies.

Employability

TEXT/REFERENCES

1. StrategicManagement ConceptsAndCases,Thompson,Strickland,TMH.
2. StrategicManagementAnIntegratedApproach,Hill,Jones,6thEdition,IndianAdaptation,Biztantra.
3. StrategicManagement ConceptsAndCases,David,12thEdition,PHI.
4. BusinessEnvironmentForSt rategicManagement,Aswathappa,HPH

SEM	TWO	NATURE	PRACTICAL	L	P	T	C
COURSECODE		20220SEC02		0	2	0	1

DATA ANALYSIS (MS-EXCEL LAB)

COURSE OBJECTIVE: The course aims to understand MS Excel for applying statistical tools.

COURSE OUTCOME: Learning Outcome: The learning outcome is that the student should be able to: Analyse the data to draw inference for decision making. Understand application of statistical measures of central tendency. Understand application of ANOVA. Analyse trends. Test hypotheses.

1. Tabulation of Data in excel (Creating Master Table and Sub Table)
2. Formulas and Functions
3. Filters and Sort and Validation Lists, Data from External Sources.
4. Data Analysis Using Charts and Graphs (Pivot Table & Charts)
5. Time Value of Money
6. Measure of central tendency: mean, median, mode,
7. Measure of dispersion: variance, standard deviation, Coefficient of variation.
8. Correlation, regression lines.
9. t-test
10. F-test
11. ANOVA one way classification,
12. Chi square test, independence of attributes.
13. Time series: forecasting Method of least squares,
14. Moving average method

TEXT/REFERENCES

1. Glyn Davis & Branko Pecar "Business Statistics Using Excel" Oxford University Press, 2012.
2. DPApte: Statistical Tools for Managers USING MSEXCEL, Excel, 2012.
3. David M Levine, David F. Stephan & Kathryn A. Szabat, Statistics for Managers – Using MS Excel, PHI, 2015.
4. Bruce Bowerman, Business Statistics in Practice, TMH, 5/e 2012.
5. Shelly, MS Office, 2007, Cengage, 2009.
6. Ajai. S. Gaur, Sanjaya S. Gaur, Statistical Methods For Practice and Research, Response, 2009

SEMESTER-III

SEM	THREE	NATURE	CORE	L	P	T	C
COURSECODE	20260SEC31			4	0	0	3

INTERNATIONALBUSINESSENVIRONMENT

COURSEOBJECTIVE: To familiarize the student to the basic concepts of international business management

COURSEOUTCOME: Students would be familiar with global business environment, global strategic management practices and get acquainted with functional domain practices. They would be familiar with conflict situations and ethical issues in global business.

UNIT-I Nature and scope of international business-Growing relevance of international business-Types, Importance of international business. Business environment- internal and external environment. Economic and political Environment-Economic roles of Government-Demographic environment-Cultural environment.

UNIT-II International Economic Institutions-IMF, World Bank, UNCTAD, UNIDO, GATT, WTO-organizational Structure, objectives and functions

UNIT-III International Trade-Theories-Adam Smith, David Ricardo, Heckscher-Ohlin, and Leontief Paradox. Government influence on trade-protectionism. Exim policy of India-Export promotion-incentives-SEZ-objectives of SEZ.-BoP vs BoT-Components of BoP.

UNIT IV MNCs- Benefits to host country-problems of MNCs –MNCs in India. Transfer of technology-levels, channels-methods of technology transfer-International investments-Significance and types of international investments-FDI, FII-factors affecting FDI-Cross-border M&As.

UNIT-V Globalisation and business –Features of globalization-essential conditions for globalization-foreign market entry strategies-Pros and cons of Globalisation.Global competitiveness-determinants and its pillars-IT revolution and Business Environment.

Employability

TEXT/REFERENCES

Francis Cherunilam, "International Business Environment", Himalaya Publishing House Mumbai,

Edition

K. Aswathappa, "Essentials of Business Environment- Text, Cases & Exercises", Himalaya Publishing House, Mumbai, 12th Revised Edition.

4th

SEM	THREE	NATURE	CORE	L	P	T	C
COURSECODE	20260SEC32			3	0	1	4

OPERATIONSRESEARCH

COURSE OBJECTIVE: To learn the concepts of operations research applied in business decision making using Operations Research Models. To facilitate the students to find out optimal solution for transportation and assignment problems and to empower to equip with the skills of decision making using quantitative techniques

COURSE OUTCOME: To facilitate quantitative solutions in business decision making under conditions of certainty, risk and uncertainty. Develop mathematical models using various techniques for successful project implementation.

Unit I Scope and applications of Operation Research in managerial decision-making- Decision-making environments: Decision-making under certainty, uncertainty and risk situations; Uses of Decision tree.

Unit II Linear programming: Mathematical formulations of LP Models for product-mix problems; graphical and simplex method of solving LP problems; sensitivity analysis; duality
 Transportation problem: Various method of finding Initial basic feasible solution and optimal cost-
 Assignment model: Algorithm and its applications

Unit III Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point; Odds Method; Dominance Method and Graphical Method for solving Mixed Strategy
 Game Sequencing Problem: Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m Machines Problems.

Employability

Unit IV Queuing Theory: Characteristics of M/M/I Queue model; Application of Poisson and Exponential distribution in estimating

Arrival Rate and Service Rate; Applications of Queue model for better service to the customers

Replacement Problem: Replacement of assets that deteriorate with time, replacement of assets which fails suddenly.

Unit V Project Management: Rules for drawing the network diagram, Application of CPM and PERT techniques in project planning and control; Crashing and resource leveling of operations Simulation and its uses in Queuing theory & Materials Management

TEXT/REFERENCES

- 1) Vohra- Quantitative Techniques in Management (Tata McGraw-Hill, 2nd edition), 2003.
- 2) Peter C Bell- Management Science/ Operations Research (Vikas)
- 3) Kothari- Quantitative Techniques (Vikas), 1996, 3rd ed.
- 4) Akhilesh K B and Balasubramanyam S- Quantitative Techniques (Vikas)
- 5) Taha Hamdy- Operations Research- An Introduction (Prentice-Hall, 7th edition), 1996, 5th ed.
- 6) J K Sharma- Operations Research (Pearson)

SEMESTER-IV

SEM	FOUR	NATURE	CORE	L	P	T	C
COURSECODE		20260SEC41		4	0	0	4

ENTREPRENEURIAL DEVELOPMENT

COURSE OBJECTIVE: The objective of this course is to familiarize the students with the ground realities of starting & managing their own Entrepreneurial ventures.

COURSE OUTCOME: Students will gain knowledge and skills needed to run a business. Gives required competencies to run the successful enterprise. Prepared to become an entrepreneur.

UNIT I INTRODUCTION TO ENTREPRENEURSHIP Understanding the Meaning of Entrepreneur; Characteristics and Qualities of an Entrepreneur; Classification of Entrepreneurs; Factors Influencing Entrepreneurship; Entrepreneurial Environment; Entrepreneurial Growth; Problems and Challenges of Entrepreneurs; Entrepreneurial Scenario in India

UNIT II ENTREPRENEURSHIP FEASIBILITY ANALYSIS Starting an Enterprise; Idea Generation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities

UNIT III LAUNCHING OF SMALL BUSINESS Business plan – Meaning, Scope and Need; Business plan Formats; Project report preparation and presentation; Project appraisal; Why some business plan fails? MSMEs, Financial support banks, institutions and agencies; Venture capital; Government schemes and Policies

Entrepreneurship

UNIT IV DEVELOPMENT OF SMALL BUSINESS Role of Government and other Agencies in Promoting Small Business - Preventing Sickness and Rehabilitation of Business Units- Incentives, Subsidies and Grants - Training for Effective Management of small Business.

UNIT V WOMEN ENTREPRENEURS Women Entrepreneurs Problems & Prospects in Women Entrepreneurships, Role of Government in Promoting Women Entrepreneurs. Development of Self Help Groups, Steps taken by Government in Promoting SHGs..

TEXT/REFERENCES

1. Small Scale Industries And Entrepreneurship, Vasant Desai, HPH.
2. Entrepreneurial Development, Jayshree Suresh, Margham.
3. Entrepreneurship New Venture Creation, Holt, PHI.
4. Entrepreneurship In The New Millennium, Kuratko, Hodgetts, South Western Cengage Learning.
5. Entrepreneurship, Histich, Peters, 6th Edition, TMH.

SEM	FOUR	NATURE	PROJECT	L	P	T	C
COURSECODE		20260PRW44		0	0	0	10

MARKETING

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA33			3	0	0	3

CONSUMER BEHAVIOUR

COURSE OBJECTIVE: The basic objective of this course is to develop an understanding about the consumer decision making process and its applications in marketing function of firms.

COURSE OUTCOME

Able to explain the basic concepts and models of consumer behavior. Able to analyze the effects of psychological, socio-cultural and demographic factors on the consumer decision process with their results. Able to distinguish the relationship between consumer behavior and marketing practices. Able to define the importance of consumer behavior for businesses

Able to compare the relationship between consumer behavior and other disciplines.

UNIT I Introduction - Scope & importance, the consumer research process, quantitative and qualitative research. Market segmentation: Importance and use - Application of Consumer behaviour principles to strategic marketing - Theories of Consumer Behaviour - Consumer decision: Process approach - Factors influencing consumer decision making, Segmentation, Psychographics & VALS; Diffusion of Innovations

UNIT – II Consumer Motivation & Perception - Consumer needs and motivation, Psychographics - Rational vs emotional motives. Dynamic nature of motivation. Motivational research. Personal and psychological influences - Product and Service Positioning, Perceived price, quality and risk - Consumer Attitude formation and Change Concept of attitude, Attitude formation,

UNIT – III Sociocultural Influences Socializations, Family Buying decision, Family Lifecycle, Social Class, Lifestyle Profiles, Culture, Sub-culture, Measurement of Culture, Cultural aspects of emerging markets, Cross Cultural Consumer Behaviour – Communication - Influences on Consumer behavior, High and low involvement - Pre-purchase and post-purchase behavior.

UNIT – IV Consumer Decision Making Process: Consumer Decision making process, Comprehensive models of consumer decision making. New Product purchase and repeat purchase - Problem Recognition - Types of consumer decisions, types of Problem Recognition, Utilizing problem recognition information

UNIT – V Consumer Behaviour Applications: Consumer Behaviour applicable to Profit and Non Profit Service Organizations, Societal Marketing Concept, Government Policy and Consumer Protection, Indian Consumer and Marketing Opportunities in India - Consumerism, consumer protection, consumer right and consumer education, legal consideration. E-Buying behavior
Employability

TEXT/REFERENCES

1. Consumer Behavior – Leon Schiffman, Leslie Lazar Kanuk – Pearson / PHI, 8/e
2. Consumer Behavior – Hawkins, Best, Coney – TMH, 9/e, 2004
3. Customer Behavior – A Managerial Perspective – Sheth, Mittal – Thomson, 4.
4. Conceptual Issues In Consumer Behavior Indian Context – S Ramesh Kumar, Pearson
5. Consumer Market demographics in India – Edited by S.L. Rao

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA34			3	0	0	3

INTEGRATED MARKETING COMMUNICATION

COURSE OBJECTIVE: Due to ever increasing business dealings the subject of International Marketing has gained utmost importance in recent times. The world these days, indeed has shrunk and foreign markets have particularly become important especially for a developing country like India. The major objective of this course is to provide an exposure to the area of Marketing in the International perspective.

COURSE OUTCOME Students create and manage these promotional tools to successfully execute a business' strategic plan.

Unit I: Introduction Integrated Marketing Communication - Concept, Process, Communication Mix, IMC plans- Overview of advertising management; Advertising and IMC process - Advertising Agency - Choosing an advertising agency; Advertising planning and research; Advertising goals- Advertising budget; Advertising design; Advertising media selection.

Unit II: Sales Promotion The scope and role of sales promotion; Types, Planning Sales Promotion Programmes; Consumer oriented sales promotion; Trade oriented sales promotion; Coordinating sales promotion and advertising; Personal Selling, Role, Advantages and Disadvantages, Personal Selling Skills.

Unit III: Public Relations, Publicity and Corporate Advertising Public Relations Publicity and Corporate advertising; Public Relations functions; Creating positive image building activities; Preventing or reducing image damage; sponsorship and event marketing; Role of internet in PR.

Employability

Unit IV: Social and Ethical Aspects of Advertising and Promotion Regulations of Advertising and Promotion in India, regulation of other Promotional Areas, Social Implications of Advertising, Moral and Ethical Issues in Advertising; Advertising to children, Advertising controversial products, Social Aspects of Advertising.

Unit V: Evaluation Monitoring and Control Measuring the effectiveness of promotional program; Conducting research to measure advertising effectiveness; Testing process; Establishing the program for measuring the advertising effects; Measuring the effectiveness of other program elements.

TEXT/REFERENCES

1. George Belch, Michael Belch & Keyoor Purani, Advertising & Promotion - An Integrated Marketing Communications Perspective, TMH, Latest Edition.
2. Kruti Shah and Alan D'Souza, Advertising & Promotions: An IMC perspective, TMH, Latest Edition.
3. Terence A. Shimp, Advertising & Promotion: An IMC Approach, Cengage Learning, Latest Edition.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA35			3	0	0	3

BRANDMANAGEMENT

COURSEOBJECTIVE:Theobjectiveofthiscourseistointroducestudentstothebasicscope,benefitsand typesofbrands;andunderstandthestepsinvolvedindesigninganappropriatebrandfortheorganization.

COURSEOUTCOME – Evaluate the feasibility of a new brand launch.Develop and execute a new brand launch plan.Evaluate the performance and situation of a brand for the purpose of recommending future strategies.Measure the value of a brand to an organization using industry standard methods.Develop a communication strategy which integrates all communication elements – traditional and interactive.

UNIT I Introduction Concept of Brand, Significance of Branding for Consumers and for Firms, Branding Challenges & Opportunities, Concept of Brand Equity, Cost based, Price based and Customer based Brand Equity.

UNIT II Brand Strategies Strategic Brand Management process – Building a strong brand – Brand positioning – Establishing Brand values – Brand vision – Brand Elements – Branding for Global Markets – Competing with foreign brands.

UNIT III Planning and Implementing Brand Marketing Programs Choosing brand elements to build brand equity, Options and tactics for Brand, New perspectives on marketing, Integrating marketing communication to build brand equity, Conceptualizing the leveraging process, Co-branding, Celebrity Endorsements

Employability

UNIT IV Measuring and Interpreting Brand Performance The brand value chain, Designing brand tracking studies, Capturing customer mind set through quantitative research techniques

UNIT V Growing and Sustaining Brand Equity Brand architecture, Brand hierarchy, Designing brand strategy, New products, Brand extensions- advantage and disadvantage, Reinforcing brands, Revitalizing brands, Brand failures.

TEXT/REFERENCES

1. Strategic Brand Management- Kevin Lane Keller
2. Branding Concepts & Process- Debashish Pati
3. Marketing Management- Philip Kotler
4. Successful Branding- Pran K Choudhary
5. Brand Positioning Strategies for Competitive Advantage- Subrato Sen Gupta
6. Strategic Brand Management- Capereer
7. Behind Powerful Brands- Jones
8. Managing Indian Brands- S. Ramesh Kumar

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA36			3	0	0	3

RETAIL MANAGEMENT

COURSE OBJECTIVE: The objective of this course is to introduce students to the basic scope, benefits and types of retailers; and understand the steps involved in designing an appropriate retail organization structure.

COURSE OUTCOME Understand the functions of retail business and various retail formats and retail channels. Understand the difference between Retail and Manufacturing Supply Chain Understand, key drivers of retail supply chain and how to select a retail store location Analyze Retail Market and Financial Strategy including product pricing.

UNIT I INTRODUCTION An overview Retailing – Channels of Distribution, Functions of Retailers, Evolution of Retailing – Global Retail Scenario – Indian Retail Scenario – Emerging Trends and Opportunities in Retail Industry – economic and technological Influences on retail management – Classification of Retailers – Non Traditional Retail Classifications.

UNIT II RETAIL FORMATS Organized and unorganized formats – Different organized retail formats – Characteristics of each format – Emerging trends in retail formats – MNC's role in organized retail formats.

UNIT III RETAIL ADMINISTRATION Choice of retail locations - internal and external atmospherics – Positioning of retail shops – Building retail store Image - Retail service quality management – Retail Supply Chain Management – Retail Pricing Decisions. Merchandising and category management – Human Resources Management – Information System - Buying.

UNIT IV RETAIL SHOP MANAGEMENT Visual Merchandise Management – Space Management – Retail Inventory Management – Retail accounting and audits - Retail store brands – Retail advertising and promotions – Retail Management Information Systems - Online retail – Role of Communication in Retailing – Methods of Retail Communication.

UNIT V RETAIL SHOPPER BEHAVIOUR Understanding of Retail shopper behavior – Shopper Profile Analysis – Shopping Decision Process - Factors influencing retail shopper behavior – Complaints Management – Retail sales force Management – Challenges in Retailing in India.

Skill development

TEXT/REFERENCES

1. Michael Havy, Baston, Aweitz and Ajay Pandit, Retail Management, Tata Mcgraw Hill, Sixth Edition, 2007
2. Ogden, Integrated Retail Management, Biztantra, India, 2008.
3. Patrick M. Dunne and Robert F. Lusch, Retailing, Thomson Learning, 4th Edition 2008.
4. Chetan Bajaj, Rajnish Toward Nidhi V. Srivatsava, Retail Management, Oxford University Press, 2007.
5. Swapna Pradhan, Retail Management - Text and Cases, Tata Mc Graw Hill, 3rd Edition, 2009.
6. Dunne, Retailing, Cengage Learning, 2nd Edition, 2008
7. Ramkrishnan and Y.R. Srinivasan, Indian Retailing Text and Cases, Oxford University Press 2008
8. Dr. Jaspreet Kaur, Customer Relationship Management, Kogent solution.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA37			3	0	0	3

SALES MANAGEMENT

COURSE OBJECTIVE: The purpose of this paper is to acquaint the student with the concepts which are helpful in developing a sound sales policy and in organizing and managing sales force and marketing channels and to impart the knowledge about sales management procedure, and activities.

COURSE OUTCOME - Develop a plan for organizing, staffing and training a sales force. Know the distinction between the skills required for selling and sales management. Identify the key factors in establishing and maintaining high morale in the sales force. Develop an effective sales compensation plan. Evaluate the performance of a sales person.

UNIT – I Sales Management - Nature, Meaning, Evolution and Scope, Objectives of Sales Department, Sales as a function of Marketing Management, Theories of Selling – Buyer Seller Dyads, AIDAS Theory, Right Set of Circumstances Theory, Buying Formula Theory, Behavioral Equation Theory of the Sales Management-Sales Planning, Strategic role of sales management

UNIT – II Selling Process - Prospecting, Planning the Sales call, Selecting the Presentation Method, Making the Sales - Personal Selling - Presentation, Handling Sales Objections, Closing the Sale, Follow up. Role of Relationship Marketing in Personal Selling, Value Added Selling

UNIT – III Nature of Sales Management positions - Functions of Sales Executives - Qualities of Effective Sales Executives - Relationship with Top Management - Management of Sales force, Recruitment & Selection, Training and Evaluation, Compensating Sales Force - Supervision of Salesmen; Motivating Sales Personnel; Sales Meetings and Sales Contests

Skill development

Unit IV Channel Intermediaries – Wholesaling and Retailing; Logistics of Distribution; Channel Planning Organisational Patterns in Marketing Channels; Managing Marketing Channels; Marketing Channel Policies and Legal Issues - Warehouse Management - Warehouse Functions, Processes, Organization and Operations

Unit V Information System and Channel Management, Assessing Performance of Marketing Channels including sales force; International Marketing Channels

TEXT/REFERENCES

1. Sales Management - Richard R. Still Edward W. Cundiff
2. Strategies for selling - Gerald A. Michaelson
3. Sales Management Handbook - Forsyth P. Trick
4. Value added selling - Tom Reilly
5. Building a Winning Sales Team - Gini Graham & Scott

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA38			3	0	0	3

SERVICESMARKETING

COURSEOBJECTIVE:

The objective of the course is to develop an understanding of services and service marketing with emphasis on various aspects of service marketing which make it different from goods marketing.

COURSEOUTCOME - Understand the Concept of Services and intangible products 2. Discuss the relevance of the services Industry to Industry 3. Examine the characteristics of the services industry and the modus operandi 4. Analyse the role and relevance of Quality in Services 5. Visualise future changes in the Services Industry

UNIT I Introduction-

Definition, Differences between Services and Goods, Tangibility Spectrum, Distinctive Characteristics of Services, Classification of Services, Categories of Service Providers, Marketing Implications of Service Characteristics, Services Marketing Mix – People, Physical Evidence & Process..

UNIT II Assessing service market potential - Classification of services – Expanded marketing mix – Market segmentation, targeting and positioning - Service Life Cycle – New service development – Service Blue Printing – GAP’s model of service quality – Measuring service quality – SERVQUAL – Service Quality function development - Customer perception, Customer satisfaction, Tolerance zone.

UNIT III Physical Evidence and Servicescape Meaning, Types of Servicescapes, Strategic Roles of Servicescape, Guidelines for Physical Evidence Strategy, Strategic Roles of Servicescape - Internal Marketing, Service-Profit Chain, Emotional labor, Customers' role in service delivery, Customer as a co-producer.

UNIT IV Positioning of services – Designing service delivery System, Service Channel – Pricing of services, methods – Service marketing triangle - Integrated Service marketing communication
Skill development

UNIT V Applications & Strategies of Service Marketing: Marketing of service Sector - Financial Services, Tourism Services, Education Services, Information services (ITES), Health Services, Health Tourism Services - CRM in Service Sector.

TEXT/REFERENCES

SUGGESTED READINGS:

1. Services Marketing- Zeithaml, Bitner, Gremler & Pandit, TMGH, 4th ed.
2. Services Marketing - Christopher Lovelock
3. Services Marketing - Rampal & Gupta
4. Essence of Services Marketing - Ardian Payne
5. Services Marketing - Helen Woodruffe

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EA39			3	0	0	3

INDUSTRIAL MARKETING

COURSE OBJECTIVE: The first part deals with industrial marketing and especially on strategic industry analysis, understanding organizational buying behavior and management of market channels. The second part offers and introduction to major theories and trends within international business.

COURSE OUTCOME: The course is given at the 4th year in the MTIØT program and is mandatory in the first year of the MIENTRE program and aims to contribute to objective 2.2 in the MTIØT objective that requires: "Knowledge ... in line with a masters student in business administration in comparable international studies". The course should give general knowledge on industrial marketing, internationalization, international management and international business.

Unit I Introduction to Business marketing - Organizational buyer- Buyer Behaviour- Business marketing and Consumer marketing- Business products- Organizational buying Process- Classification of Industrial Customers and Industrial Products, Industrial Marketing Environment

Unit II Strategies for customer relationship management for business markets- Strategic planning- Relationship marketing- Managing buyer-seller relationship- Measuring customer profitability - Methods of forecasting demand- Components of Business models- Strategic resources of business marketing - Customer Satisfaction Management and Measurement, Customer Loyalty

Unit III Managing products- Innovation & new product development- Business-to-Business brand- Product positioning- Management of innovation- Steps in New product development- Delivering effective customer solutions- Business-service marketing- Service quality- Service packages- Product line planning.

Unit IV Marketing Strategies Industrial Markets - Product, Price, Promotion and Distribution. Marketing Research for Industrial Products- Marketing strategy for Industrial Firms- Developing & Evaluating Strategies - Effective implementation of Strategies.

Unit V Managing channels- B2B in e-commerce platform & SCM- Pricing strategies: Business marketing channels- Cost of Logistics- B2B logistical management- Pricing Business products across their lifecycle- Competitive pricing tactics- Marketing Communications- advertising & sales promotion- Personal selling- Performance measurement.

Skill development

TEXT/REFERENCES

1. Electronic Commerce Technologies & Applications, Bhaskar Bharat, TMH
2. E-Commerce An Indian Perspective, Joseph P. T., PHI
3. E-Commerce: Strategy Technologies & Applications, Whiteley, David, TMH
4. Industrial Marketing Management M. Govindarajan, Vikas Publishing House PVT Ltd.
5. Industrial Marketing by MILIND T. Phadtare - PHI Learning PVT Ltd.,

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EA42		3	0	0	3

CUSTOMER RELATIONSHIP MANAGEMENT

COURSE OBJECTIVE: The paper is designed to impart the skill based knowledge of Customer Relationship Management. The purpose of the syllabus is to not just make the students aware of the concepts and practices of CRM in modern businesses but also enable them to design suitable practices and programs for the company they would be working.

COURSE OUTCOME - Understand the basic concepts of Customer relationship management. To understand marketing aspects of Customer relationship management. Learn basics of analytical Customer relationship management. Understand basics of operational Customer relationship management

UNIT I INTRODUCTION Definitions - Concepts and Context of relationship Management – Evolution - Transactional Vs Relationship Approach – CRM as a strategic marketing tool – CRM significance to the stakeholders.

UNIT II UNDERSTANDING CUSTOMERS Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behavior in relationship perspectives; individual and group customer's - Customer life time value – Selection of Profitable customer segments.

UNIT III CRM STRUCTURES Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Model of CRM – CRM road map for business applications
Skill development.

UNIT IV Mechanics of CRM Strategic CRM planning process – Implementation issues – CRM Tools- Analytical CRM – Operational CRM – Call center management – Role of CRM Managers - e CRM Solutions – Data Warehousing – Data mining for CRM – an introduction to CRM software packages.

UNIT V Managing Networks for CRM Business Networks, Network Position, Supplier Networks, Distribution Networks, Management of Networks, Supplier Relationships, Product Development, Supplier Accreditation Programmes, Process Alignment, E Procurement, Partners in Value Creation, Benchmarking Partners, Customer Advocacy Groups, Sponsors, Partners in Value Delivery.

TEXT/REFERENCES

1. G. Shainesh, Jagdish, N. Sheth, Customer Relationships Management Strategic Perspective, Macmillan 2005.
2. Alok Kumar et al, Customer Relationship Management : Concepts and applications, Biztantra, 2008
3. H. Peeru Mohamed and A. Sahadevan, Customer Relation Management, Vikas Publishing 2005.
4. Jim Catheart, The Eight Competencies of Relationship selling, Macmillan India, 2005.
5. Assel, Consumer Behavior, Cengage Learning, 6th Edition.
6. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2007.
7. Francis Buttle, Customer Relationship Management: Concepts & Tools, Elsevier, 2004.
8. Zikmund. Customer Relationship Management, Wiley 2012.
9. G. Shainesh, J. Jagdish N Seth. Customer Relationship Management

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
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COURSECODE	20260EA43	3	0	0	3
INTERNATIONAL MARKETING					
COURSE OBJECTIVE: The course has been developed so as to acquaint the students with environment, procedural, institutional and decisional aspects of International Marketing.					
COURSE OUTCOME - Classify strategies for entering export markets from extant knowledge and research. Apply core theoretical concepts in international marketing to find practical solutions to constraints of small businesses.					
UNIT I INTRODUCTION Nature and scope of International Marketing, Key issues in International Marketing. - Business Practices and Ethics, Cultural, Political, and Legal Environment, Minimizing Environmental Risk.					
UNIT II POLICY FRAMEWORK AND PROCEDURAL ASPECTS Balance of Payment - India's Export - Import policy - Exim Policy - promotional measures - Export oriented Units - Deemed Exports - Export-Import Documentation - Kind of Documents - Principal Export Documents - Auxiliary documents - Documents in Import Trade - Export Documentation and procedures - Demand Estimation - GDP - Producer consumer target - Market segmentation.					
Unit III PLANNING FOR INTERNATIONAL MARKETING Marketing Research, Marketing Information Sources, Marketing Information System, Market Analysis Foreign Market Entry Strategies - Exporting, Licensing, Joint Ventures, Strategic Alliances, Acquisitions Franchising, Assembly Operations, Management Contracts, Turnkey Operations, Free Trade Zones					
UNIT IV INTERNATIONAL MARKETING DECISIONS Developing an International Product Line, Foreign Product Diversification, International Branding Decisions, International Packaging, International Warranties and Services. International Pricing Strategy - International Promotion Strategies - Promotion Mix - International Sales Negotiations - Patterns of Global Advertising, Global Advertising Regulations, Advertising Media, International Channels of Distribution - Retailing in International Scenario, International Physical Distribution - Technological Influences in international Marketing - Current trends in international Marketing.					
Employability					
Unit-V IMPLEMENTING GLOBAL MARKETING STRATEGIES Negotiation with customers and selection method, E-Marketing channels organization & controlling of the global marketing programme.					
TEXT/REFERENCES					
<ol style="list-style-type: none"> 1. Varshney R.L. and Bhattacharya, B - International Marketing Management (Sultan Chand & Sons) 2. Philip B. Cateoran and John M. Hess: International Marketing. 3. Alexander C. Stanley: Handbook of International Marketing. 4. John Fayerweather: International Marketing 5. David Carson: International Marketing 6. Philip Kotler: Marketing Management 					



SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EA44		3	0	0	3

RURAL MARKETING

COURSE OBJECTIVE: The objective of this course is to explore the student to Rural Marketing environments so that they can understand consumer's and marketing characteristics of the same for understanding and contributing to the emerging challenges in the upcoming global economic scenario.

COURSE OUTCOME: Understand the scope, growth, importance of rural marketing and rural environment. 2. Know the concept of rural marketing research and examine the differences between rural, semi-urban and urban markets. 3. Identify the classification of rural consumer based upon the economic status and rural consumer behavior. 4. Examine the rural marketing segmentation, the significance and problems of regulated markets. 5. Analyze classification of markets and the role of regulated markets on marketing of agricultural products.

UNIT I Introduction of Rural marketing –Evolution of Rural Marketing in Indian and Global Context- Definition- Nature, Evolution, Scope-Characteristics and potential of Rural Marketing - Importance of Rural Marketing- Factors affecting Rural Marketing- Rural Vs Urban Marketing- Structure of Rural Marketing –Recent Trends in Rural Marketing.

UNIT II Rural Marketing Mix: Product Decisions, Pricing Decisions, Promotion Decisions, Distribution, Channel Management, Relationship Management Physical Distribution, Sales force management

Unit III Rural Marketing research- Consumer Behaviour- segmentation of rural market- New product development- Product life cycle and Rural Marketing Strategies

UNIT IV Product / Service Classification in Rural Marketing - Brand Management in Rural Marketing- Fostering Creativity & Innovation in Rural Marketing --Sales force Management in Rural Marketing.

Employability

UNIT V Retail & IT models in Rural Marketing- CSR and Marketing Ethics in Rural Marketing- Consumer Education & Consumer Methods in Promotion of Rural Marketing- Advertisement & Media Role in Rural Marketing Promotion Methods. e-Rural Marketing- CRM & e-CRM in Rural Marketing- Advanced Practices in Rural Marketing- Social Marketing- Network Marketing- Green Marketing

TEXT/REFERENCES

1. Badi & Badi: Rural Marketing, HPH.
2. Rural Marketing – Dogra, Ghuman – TMH
3. Rural Marketing – K. Ramakrishnan – Pearson
4. Rural Marketing – Kashyap, Raut – Biztantra
5. Rural Marketing – T.P. Gopalaswamy – Vikas

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HUMANR ESOURCES

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB33			3	0	0	3

SUBJECT TITLE: KNOWLEDGE MANAGEMENT

OBJECTIVE:
 The goal of the course is to prepare students to become familiar with the current theories, practices, tools and techniques in knowledge management (KM), and to assist students in pursuing a career in the information sector for profit and not for profit organizations. In addition, students will learn to determine the infrastructure requirements to manage the intellectual capital in organizations.

COURSE OUTCOMES
 Use a framework and a clear language for knowledge management concepts; Describe how valuable individual, group and organizational knowledge is managed throughout the knowledge management cycle; Define the different knowledge types and explain how they are addressed by knowledge management; Describe the major roles and responsibilities in knowledge management implementations; Identify some of the key tools and techniques used in knowledge management applications.

Unit-I: The Knowledge Economy: Data–Information-Knowledge, Attributes of Knowledge as an Economic Resource – Knowledge Capital Vs Physical Capital - Types of Knowledge - Scope of Knowledge Management-Building Knowledge Societies.

Unit-II: Knowledge Management and Information Technology: Role of Information Technology in Knowledge Management Systems, Knowledge Management Tools and Knowledge Portals – Knowledge Organization & Managing Knowledge Workers

Unit-III: The Knowledge Process: Knowledge Management Systems Life Cycle - Stages of KM Process, Knowledge Creation & Knowledge Architecture– Knowledge Capturing Techniques– Knowledge Codification– Transferring and Sharing Knowledge.

Unit-IV: Implementation of Knowledge Management: Business Intelligence and Internet Platforms, KM & the Indian experience, Net Banking in India– Role of Knowledge Management in Organizational Restructuring– The Mystique of a Learning Organization - Management of Intellectual Property.

Skill development

Unit-V: Future of Knowledge Management and Industry Perspective: Knowledge Management in Manufacturing and service industry, Challenges and Future of Knowledge Management - Measures for meeting the Challenges of KM - Business Ethics and KM.

SUGGESTED READINGS:

1. Mattison: Web Warehousing & Knowledge Management, Tata McGraw-Hill, 2009
2. Becerra Fernandez: Knowledge Management: An Evolutionary View, PHI, 2009
3. Fernando: Knowledge Management, Pearson, 2009
4. B. Rathan Reddy: Knowledge Management, Himalaya, 2009
5. Madan Mohan Rao, Leading with Knowledge, Tata McGraw-Hill, 2011

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB34			3	0	0	3

SUBJECT TITLE: ORGANIZATIONAL DEVELOPMENT AND CHANGE MANAGEMENT

OBJECTIVE:

The objective of this paper is to prepare students as organizational change facilitators using the knowledge and techniques of behavioral science.

COURSE OUTCOMES

Gaining knowledge about organizational development process. How to change and develop organizations. Better understanding of the change management model. Skills needed to develop an action plan for the development process. Better understanding of change resistance and how to handle it.

Unit I: Organizational Development Concept – OD Models - Characteristics of OD – OD Components - Process and Methods of Managing Organization Development

Unit II: OD Interventions: Nature of OD interventions – Team Interventions, Personal, Interpersonal & Group Process Interventions – Comprehensive Interventions – Structural Interventions – Problems in OD Interventions, Resistance – individual & organizational.

Unit V: Benefits of OD - OD Consultant: Role, Skills and Dilemmas – Success and Failures of OD - Special Applications of OD - Issues in OD – Future of OD & New Perspectives.

Unit IV: Perspectives on Change – How people experience Change - Types of Changes – Forces for Change – Need for Change - Change Process – Seven phases of Change - - organisational culture and change - Factors influencing organisational change – Managing change from gender perspective.

Unit V: Model of Organisational change, causes of failure of changes, organization changes and process consultation, Manager and the change, Internal and external agent of change - Change Agents and their Role - Contemporary Issues in Organisational Change - Managing resistance to change, effective implementation of change.

Skill development

SUGGESTED READINGS:

1. W.L. French & CH Bell: Organization Development, Prentice Hall of India/Pearson Education.
2. SP Robbins: Organizational Behaviour, Prentice Hall of India
3. Udai Pareek : Understanding Organizational Behaviour, OUP
4. Nilakant and Ramnarayan: Managing Organisational Change, Response Books
5. K. Harigopal: Management of Organizational Change, Response Books.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EB35		3	0	0	3

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SUBJECT TITLE: PERFORMANCE MANAGEMENT

OBJECTIVE:
 The objective of this course is to help the students gain understanding of the functions of performance management system in the organization and provide them tools and techniques to be used in appraising the performance of the employees.

COURSE OUTCOMES
 Define performance management and offer several examples of how a good performance management system can improve an organization's results.
 Outline the importance of connecting an employee's daily tasks to an organization's mission, vision, values, and business goals.

UNIT-I

Introduction, Role of performance in organization, Dimensions of Performance, Relevance of objectives in organizations, Organizational & individual performance, Performance management & human resources management, Performance Management Process – Performance Management & Performance Appraisal.

UNIT-II

Performance planning, Performance analysis, KPAs, Components of Performance planning, Objectives of performance analysis, Process of Performance analysis – Implementation process, Factors affecting implementation – Pitfalls in implementation – Experiences in performance management – Traditional practices, Recent approaches – Balance Scorecard approach to PMS – Benchmarking process.

UNIT-III

Purpose of Performance Appraisal, Who can Appraise, Performance appraisal factors, Pros & Cons of Appraising, Appraisal Methods on the basis of approaches – Ranking – Forced Distribution – Paired Comparison – Check List – Critical Incident – Graphic Rating Scale – BARS – MBO – Human Resource Accounting – 360 degree Feedback – Definition & Uses of 360 degree feedback – Rationale for 360 degree feedback – Scope of application in various industries – Advantage and disadvantage of 360 degree feedback.
Employability

UNIT-IV

Significance of review, Process of performance review, Performance rating, Rating Errors, Reducing rater bias, Performance review discussions, Objectives, Requisites, Process, Role of mentoring, Coaching in performance review discussions.

UNIT-V

Essentials of Good Performance Management System - Appraisals & HR Decisions, Reward systems & legal issues in PMS, Managing team performance – Role of Technology in Performance Management - Concept of Potential Appraisal – Requirements for an Effective Potential Appraisal system - Performance Appraisal and Potential Appraisal.

SUGGESTED READINGS:

1. “Prem Chadha”, Performance Management, Macmillan, 2008.
2. “T.V.Rao”, Performance Management & Appraisal Systems, Response Books, 2007.
3. “Herman Aguinis”, Performance Management, Pearson Education, 2008.
4. “Peter Ward”, 360 Degree Feedback, Jaico Publishing House, 2006.
5. “Dewakar Goel”, Performance Appraisal & Compensation Management, PHI, 2008.
6. “B.D.Singh”, Compensation & Reward Management, Excel Books, 2007.
7. “R.K.Sahu”, Performance Management System, Excel Books, 2007.
8. “Srinivas.R.Kandula”, Performance Management”, PHI, 2006.
9. Edited by Frances Neale, Handbook of Performance Management, Jaico Publishing, 2008.
10. “Michael Armstrong & Angela Baron”, Performance Management, Jaico Publishing, 2007.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EB36		3	0	0	3

SUBJECTTITLE:LABOURLEGISLATIONS

OBJECTIVE: This course will help the student to get exposure on Industrial Law. Understand the relationship between the employee, employer, union and government and to have awareness of various industrial laws relating to employees.

COURSE OUTCOMES
 Students will know the development and the judicial setup of Labour Laws. They will learn the salient features of welfare and wage Legislations also to integrate the knowledge of Labour Law in General HRD Practice.

UNIT I
 Factories Act, 1948-Industrial Dispute Act, 1947

UNIT II
 Industrial Employment (Standing Order) Act, 1946-Employee Provident Fund & Miscellaneous Act, 1952
 -Trade Union Act, 1926

UNIT III
 Payment of Wages Act, 1936-Minimum Wages Act, 1948-Employee State Insurance Act, 1948

UNIT IV
 Payment of Bonus Act, 1965 -Payment of Gratuity Act, 1972

UNIT V
 Workmen Compensation Act, 1923-Maternity Benefit Act, 1961-The Apprentices Act, 1961
 Employability

References:

1. N.D.Kapoor(2006), Industrial Law, Himalaya publishers
2. S.C.Srivastava(2009), Industrial Relations and Labour Laws, Vikas

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB37			3	0	0	3

SUBJECT TITLE: COMPENSATION & REWARD MANAGEMENT

OBJECTIVE:

The course is designed to promote understanding of issues related to the compensation and rewarding human resources in the organizations and to impart skills in designing, analyzing and restructuring reward management systems, policies and strategies.

COURSE OUTCOMES

Recognize how pay decisions help the organization achieve a competitive advantage. Analyze, integrate, and apply the knowledge to solve compensation related problems in organizations.

UNIT I:

Wage concepts, Theories of Wages, Importance, Wage Policy, Criteria for Wage Fixation, Techniques of Wage Determination, Wage Fixation Machinery, Wage Differentials, and Challenges of Remuneration. Impact of compensation and employees benefit on organizational effectiveness; Economic and Behavioral issues in compensation.

UNIT II:

Role of compensation in organization, Determination of Inter and Intra-industry Compensation Differentials, Internal and External Equity in Compensation Systems. Factors influencing compensation levels, compensation as motivational tool, compensation policy.

UNIT III:

Conventional reward methods and their inadequacies. Developing reward strategy – skill based pay, broadbanding, team based pay, payment by results, and performance related pay, variable compensation. Compensation for executives and R&D staff. Reward structure in new industries (BPO, IT, Hospitality, Tourism, etc.), MNCs and other organizations. Remuneration plan and business strategy.

UNIT IV:

Profit sharing, payment of bonus. Understanding Different Components of Compensation Packages like Fringe Benefits, Incentives and Retirement Plans, Compensation Practices of Multinational Corporations and Strategic Compensation Systems. Understanding tools in designing, improving and implementing compensation packages

Employability

UNIT V:

Law relating to payment of wages and bonus in India. Statutory Provisions Governing Different Components of Reward Systems- Working of Different Institutions Related to Reward System like Wage Boards, Pay Commissions, Role of trade unions in compensation management.

SUGGESTED READINGS:

1. Milkovich, Compensation, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2008.
2. B.D. Singh, Compensation and Reward Management, Excel Books, New Delhi, 2006.
3. Henderson, Richard, I: Compensation Management: Rewarding Performance, PHI
4. Henderson, Compensation Management in a Knowledge Based World, Pearson Education, New Delhi, 9th Edition.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB38			3	0	0	3

SUBJECT TITLE: CROSS CULTURAL MANAGEMENT

OBJECTIVE:
 The objective of this course is to develop a diagnostic and conceptual understanding of the cultural and related behavioral variables in the management of global organizations.

- COURSE OUTCOMES**
- Increase their behavioral effectiveness in interactions with people from other cultures;
 - Develop insights about the role of leadership to bridge across different cultures and create synergies; and,
 - Deepen self-awareness as a continuously-learning individual in a multi-cultural global system.

Unit-1: Introduction Determinants of Culture Facets of culture Level of Culture National Cultural dimensions in the business context The influence of National Culture on business culture. Business Cultures: East and West.

Unit-2: Cultural Dimensions and Dilemmas: Value orientations and Dimensions Reconciling cultural dilemmas Culture and Styles of Management: Management tasks and cultural values.

Unit-3: Culture and Organizations: Culture and corporate structures Culture and Leadership Culture and Strategy Cultural change in Organizations - Culture and marketing Cultural Diversity.
 Employability

Unit- 4: Culture and Communications: Business communication across cultures Barriers to intercultural communication Negotiating Internationally.

Unit-5: Cross Cultural Team Management: Working with International teams Groups processes during international encounters Conflicts and cultural difference Understanding and dealing with conflicts Developing Intercultural relationships.

References
 Marie-joelle Browaeys and Roger Price: Understanding Cross-Cultural Management, Pearson, 2010. David C. Thomas: Cross Cultural Management, 2/e, Sage Publications, 2008.
 Nigel Holdon, Cross Cultural Management: Knowledge Management Perspective, Pentice Hall, 2001. Parissa Haghirian: Multinational and Cross Cultural Management, Routledge, 2010.
 Richard Mead: International Management - Cross cultural Dimension, 3/e, Blackwell, 2005.

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EB39		3	0	0	3

SUBJECT TITLE: CONFLICT AND NEGOTIATION MANAGEMENT

OBJECTIVE:
 The course plan to develop an understanding of conflict dynamics and the art and science of negotiation. On the completion of syllabus, students will be in a position to answer the role that can be played by conflict resolution techniques such as mediation.

COURSE OUTCOMES
 Students will recognize the nature of conflict and its impact on interpersonal relationships and organizations. Students will demonstrate the role of communication in generating productive conflict outcomes and to use communication skills effectively in a range of specific conflict situations.

UNIT I:
 Conflict: concept, definition – sources of conflict - individual differences - power and influence - Changing view of conflict at work - Role of conflict in organizations - Conflict and organizational culture – transitions in Conflict thought-Conflict Process.

UNIT II:
 Types & Levels of conflict: Functional Vs Dysfunctional Conflict- Individual & Group Level Conflict; Organization level Conflict; Preventing & Resolving interpersonal conflict and intergroup conflict- Coalitions - Conflict resolution, Superior/subordinate interactions and conflict resolution - ethics in conflict resolution- leadership approaches to conflicts situation- managerial approaches to conflict.

UNIT III:
 Meaning and definition of stress, link between conflict and stress, sources of stress, distress vs eustress, consequences of stress, measures individuals and organizations can adopt for eliminating or managing stress.
 Employability

UNIT IV:
 Negotiations: meaning, definition and importance of negotiation, concept of bargaining and exchange, types of bargain. Approaches towards effective negotiation - Negotiation process - Negotiation as an approach to conflict management.

UNIT V:
 Negotiations Strategies- Integrative bargaining- Targets and aspirations- Contingent contracts- Trust and relationships- Issues in Negotiations- Developing negotiating skills- Negotiations simulations- in basket exercises.

- SUGGESTED READINGS:**
1. Lewicki, Saunders, Barry, Negotiation, TMGH.
 2. Eirene Rout, Nelson Omika, Corporate Conflict Management – Concepts & Skills, PHI.
 3. Subbulakshmi, Conflict Resolution Techniques, ICFAI University Press. Bar
 bara Corvette, Conflict Management, Pearson Education.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB42			3	0	0	3

^SUBJECTTITLE:INDUSTRIALRELATIONS

OBJECTIVE:

This course will help the student to get exposure on Industrial Relations. Understand the relationship between the employee, employer, union and government.

UNIT I Industrial Revolution – IR Concept, Importance & Scope – Factors affecting IR – Approaches to IR – IR Policy Pre Independence & Post Independence – ILO – Changing Scenario of Industrial unrest

UNIT II Trade Union Movement in India – Aim, objectives, structure and governing of trade unions - Theories of trade unionism - Disputes – Impact – Causes – Strikes – lockouts - layout – Prevention-Industrial harmony-Government Machinery – Conciliation – Arbitration – Adjudication-Grievance procedure

UNIT III Labour Welfare works – concepts, need, importance, scope & Features – Approaches to Labour Welfare – Worker’s Education – Concept, Objectives – Workers Education in India – Level of Workers Education – Workers Training

UNIT IV Collective Bargaining – Concept, Features, Importance – Principles of Collective Bargaining – Forms of Collective Bargaining – Process of Negotiation during Bargaining
Employability

UNIT V Worker’s Participation in Management – Concept, Objective – Forms of participation – Level of participation – Functions of Joint Council – Condition necessary for effective working

References Books

1. Dynamics of Industrial Relations, Memoria, Memoria & Gankar (2008), Himalaya Publishing House
2. Industrial Relations in India, Ratan Sen (2010) MacMillan
3. Industrial Relations Emerging Paradigms, B.D. Singh (2010), Excel Books

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB43			3	0	0	3

SUBJECTTITLE:TRAININGANDDEVELOPMENT

OBJECTIVE:

The objective of this course is to help the students gain understanding of the objectives of training in the organization and provide them tools and techniques to be used in training the employees. This paper will attempt to orient the student to tailor themselves to meet the specific needs of the organizations in training and development activities.

Unit I – Training – Concept – training and development- training and HRD – Scope – Objectives – Importance of training–Problems of training–Role and responsibilities of training–Technology in Training- Future trends in training.

Unit II–Training Process-Analysis of Training Needs–Organizational analysis:Task,Person,Requirement Analysis – Methods and Techniques of TNA – why conduct TNA – When to conduct TNA – Gathering TNA data–TNA Process–TNA Approaches.

Unit III —Important Considerations while designing training–Factors affecting training design –Constraints in design – budgeting for training – types of cost involved in training – Developing Training Objectives – types of training objectives - Designing the training programme, training implementation, training policy and plan, types of training, training methods & its advantages and disadvantages.

Unit IV- Logistical and Physical Arrangements – Implementation of Training - Tips for trainer for effective implementation – Evaluation –Types of evaluation instruments, evaluation design & techniques, training audit–Classroom Management–Training Policy.

Skill development

Unit V - The need & importance of management development - Approach to management development - Sources of knowledge and skills - Special needs of Technical Managers, Strategies to develop Technical Managers-Training for Executive Level Management– Self Development–Career Management.

SUGGESTED READINGS:

1. B.Janakiraman, Training and Development, Biztantra, New Delhi, 2008.
2. Employee Training And Development-Raymond Noe
3. Every Trainers Handbook-Devendra Agochia
4. 360 Degree Feedback, Competency Mapping And Assessment Centre-Radha Sharma
5. Training And Development-S.K.Bhatia

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EB44			3	0	0	3

SUBJECTTITLE:TALENTMANAGEMENT

OBJECTIVE: This course will help the student to get exposure on Talent management. Understand the howto acquire talent employees and how to retain such employees in the organization for effective performanceandachievementofgoals.

COURSE OUTCOMES

Understand and explain talent Management practices in India and Global level.

- Understand and explain How to Acquire and retain talent.
- Understand the interplay between various aspects of Talent Acquisition, retention and development of talent.
- Understand and appreciate the role manager to manage talent

Unit 1: Introduction to Talent Management: Overview, History, Scope and Need of Talent Management, Source ofTalent Management, Tools for Managing Talent Role of HR in Talent Management, Role of the HR Manager, TalentManagementProcess

Unit 2: Building Blocks for Talent Management:E, Talent Management System , Effective Talent ManagementSystem,BuildingBlocksofEffectiveTalentManagementSystem,CriticalSuccessFactorstoCreateTalentMana gementSystem,KeyElementsof TalentManagementSystem.

Unit3:ApproachestoTalentManagement:DevelopingaTalentManagementStrategy,MappingBusinessStrategies and Talent Management Strategies Talent Management and Organisational Environment - Shaping Talent PlanningandDevelopingValues,PromotingEthicalBehaviour

Skill development

Unit 4: Talent Planning, Acquisition, Engagement and Retention: Talent Planning, Objectives of Talent Planning,Steps in Strategic Talent Planning, Talent Acquisition, Recruiting Process, Talent Engagement and Retention,EmployeeEngagementandRetention,ImprovingEmployeeRetention

Unit 5: Compensation and reward strategies for Effective Talent Management:Sustainable Talent Managementand Reward Model,StrategicCompensation plan forTalentEngagement,TalentManagementand CorporateRestructuring; Corporate Reconstruction, Timing the Corporate Reconstruction, Organisational Issues and TalentManagementChallenges

References:

1. Cheese, Peter, Robert J Thomas and Elizabeth Craig, The Talent Powered Organization, Kogan Page Ltd.
2. Stringer, Hank & Rusty Rueff, Talent Force: A New Manifesto for the Human Side of Business, Pearson Education, Prentice Hall Upper Saddle River, New Jersey
3. Lawyer III, Edward E, Talent: Making People your Competitive Advantage, Dave Ulrich, Jossey Bass, A Wiley Imprint
4. Phillips, Jack J, Lisa Edwards, Managing Talent Retention, An ROI Approach, Pfeiffer, A Wiley Imprint
6. David, Tony, Maggie Cutt, Neil Flynn, Peter Mowl and Simon Orme, Talent Assessment, Gower Publishing Ltd., Hampshire Ltd.

FINANCE

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EC33			3	0	0	3

SUBJECT TITLE: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

OBJECTIVE:

The objective of this course is to impart knowledge to students regarding the theory and practice of Security Analysis and to give the students an in-depth knowledge of the theory and practice of Portfolio Management.

COURSE OUTCOME

To provide a theoretical and practical background in the field of investments. • Designing and managing the bond as well as equity portfolios in the real world. • Valuing equity and debt instruments. • Measuring the portfolio performances.

UNIT-I: Introduction to Investment and Securities

Introduction to Securities – Types of Securities - Investment Process – Investment Alternatives – Securities Markets - Stock Exchanges and its Functions – Functions and guidelines of SEBI. Risk Return: Security Returns-Risk Measurements–Picturing Risk and Return.

UNIT III FUNDAMENTAL ANALYSIS

Economic Analysis – Economic forecasting and stock Investment Decisions – Forecasting techniques. Industry Analysis : Industry classification, Industry life cycle – Company Analysis Measuring Earnings – Forecasting Earnings – Applied Valuation Techniques – Graham and Dodds investment ratios.

UNIT IV TECHNICAL ANALYSIS

Fundamental Analysis Vs Technical Analysis – History of Technical Analysis – Technical Tools – Dow theory - Trend Models- Market Indicators – Efficient Market Theory : Basic Concepts – The Random Walk Theory.

Employability

UNIT-III: Valuation of Securities

Valuation of Bonds: Bond VS Debenture- Classification of Bonds – Time Value Concept – Methods of Bond Return and Valuation- Bond Value Theorems – Convexity – Immunisation – Valuation of Equity: Return on Equity – Various Model of Equity Valuation.

UNIT-5: Portfolio Management

Portfolio Management: Definition – Selection of portfolio – Markowitz model – Sharp Index Model – Capital Asset Pricing Theory and Arbitrage Pricing Model – Portfolio Evaluation – Portfolio Revision.

SUGGESTED READINGS:

1. Fischer, Donald E. and Jordan, Ronald J.: Security Analysis and Portfolio Management, PHI, New Delhi
2. Bhall, V. K.: Investment Management – Security Analysis and Portfolio Management, S. Chand, New Delhi
3. Alexander, Gordon J. and Sharpe, William F.: Fundamentals of Investments: Englewood Cliffs, Prentice Hall Inc, New Jersey
4. Elton, Edwin J. and Gruber, Martin J.: Modern Portfolio Theory and Investment Analysis, John Wiley, New York.
5. Amling, Frederic: Investment, Englewood Cliffs, Prentice Hall, New Jersey

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EC34			3	0	0	3

SUBJECT TITLE: DERIVATIVES MANAGEMENT

OBJECTIVE:

To give an in-depth knowledge of the functioning of derivatives securities market.

COURSE OUTCOME Students will be able to analyze the risks in different financial markets. Acquire ability to selection of various options and then can apply them to specific markets. Student will be able to strategically manage the financial derivatives.

UNIT I INTRODUCTION

Derivatives – Definition – Types – Forward Contracts – Futures Contracts – Options – Swaps – Differences between Cash and Future Markets – Types of Traders – OTC - Derivative Market - Economic functions of derivative market.

UNIT II FUTURES CONTRACT

Specifications of Futures Contract - Margin Requirements – Contract Size - Market Quotes - Hedging using Futures – Types of Futures Contracts – Delivery Options – Relationship between Future Prices, Forward Prices and Spot Prices.

UNIT III OPTIONS

Definition – Exchange Traded Options, OTC Options – Option Pricing Models – Call and Put Options – American and European Options – Option payoff, options on Securities, Stock Indices, Currencies and Futures .

UNIT IV SWAPS & Forward Contract

Definition of SWAP – Types of SWAP - Interest Rate SWAP – Currency SWAP – Role of Financial Intermediary – Valuation of Interest Rate SWAPs and Currency SWAPs– Forward Contract– Forward Pricing

UNIT V DERIVATIVES IN INDIA

Evolution of Derivatives Market in India – Regulations & Framework – Derivative Trading – Commodity Futures - Determination of the Fair Value of Futures and Options Prices, Interactions between Spot Equity Trading and Trading in Derivatives. Index Options and Futures, Constructing an Index.

Employability

SUGGESTED READINGS:

1. Chance, Don M.; An Introduction to Derivatives; Dryden Press, International Edition
2. Chew Lillian; Managing Derivative Risk, John Wiley, New Jersey
3. Das, Satyajit; Swap & Derivatives Financing, Probes
4. Hull, J. Robert W; Understanding Futures Markets, Prentice Hall, New Delhi
5. Kolb, Robert W; Understanding Futures Markets, Prentice Hall Inc, New Delhi
6. Kolb, Robert; Financial Derivatives, New York Institute of Finance, New York
7. Marshall, John and V.K. Bansal; Financial Engineering – A Complete Guide to Financial Innovation, Prentice Hall Inc, New Delhi
8. Report of Prof. L.C. Gupta, Committee on Derivatives Trading

9. Report of Prof. J.C. Verma, Committee Report on Derivatives Trading.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260EC35			3	0	0	3

SUBJECT TITLE: PROJECT FINANCE

OBJECTIVE:

The objective of the course is to provide to the students a specialized knowledge of the techniques of evaluating proposed investments and to acquaint them with the problems encountered in the decisional process pertaining to capital investments of the project.

COURSE OUTCOME

Understand project finance, process, structures, participants and their interests Discuss types of project finance and cooperation Value projects and forecast cash flows with detailed sensitivity analysis Analyse potential financing opportunities for project finance and evaluate forms of financing

UNIT I:

Basics of Project Finance: Characteristic and major elements of Projects, Project Planning and Control, - Macroeconomic assumptions - project costs and funding

UNIT II:

Sources of Finance: Sources of finance for projects - Financial Instruments - Performance indicators for projects - project cash flows - Appraisal and validity of financing projects - Financial Engineering

UNIT III:

Project Risk Management: Project Risk - Identification - Types of Project Risks - Risk Analysis and Transfer - understanding risk measurement techniques.

EMPLOYABILITY

UNIT IV:

Contract Management: Introduction - Preparation of Tender - Initial evaluation of Tender - Preparation of promoter's bids - project conditions - Incentives and Penalties - Legal Aspects and agreements.

UNIT V:

Project feasibility analysis: capital budgeting - project evaluation - project planning - Tools used for analyzing the feasibility of a project - project appraisal process - CPM and PERT.

SUGGESTED READINGS:

1. K. Nagarajan: Project Management, New Age International Publication, New Delhi
2. Goel B. B.: Project Management
3. Albert Lester: Project Planning and Control, Butterworth & Co. (Publication) Ltd., London
4. Mohsin M.: Project Planning and Control, Vikas, New Delhi

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EC36			3	0	0	3

SUBJECT TITLE: FINANCIAL SERVICES AND INSTITUTIONS

OBJECTIVE:

This course provides an understanding of the following fund-based and fee-based financial services offered by financial intermediaries such as non-banking finance companies, banks and financial institutions. This course will also focus on issues concerning the financial management of financial intermediaries.

COURSE OUTCOME

Enable the students to understand the practical applications of statistical techniques. Develop the skills to understand the relationship among different variables. Develop the skills to calculate simple and Compound Interest.

UNIT 1 Evolution of Financial Services – Indian Financial System – Types of Financial System – Financial Markets- Operational Effectiveness – of Financial Market – Money Market – Money Market Instruments – Capital Markets – Capital Market Instruments.

UNIT – I: Non-Banking Financial Companies: Meaning – Features- Role of NBFC in India- LEASING AND HIRE PURCHASING- Legal Aspects of Hiring and Leasing- Types of Leasing.- Rights of Hirer and Hire – Purchase- Accounting Treatment of Leases- Lease Vs. Hire Purchasing

UNIT – III: Financial Institutions: Role of financial Institution in financial markets- Development Banking Institutions - IDBI, IFCI, ICICI, IRBI, NABARD, SIDBI, and EXIM Bank - Objectives, operations, schemes of financing

UNIT – IV: International Market and Financial Services International Financial Institutions- International Monetary Fund, Asian Development Bank, World Bank. International Financial Market, International Financial Assets and Services

UNIT – V: Credit Rating: Credit Rating system – Growth factors CRISIL Ratings for short term instruments Credit rating process
Skill development

SUGGESTED READINGS:

1. Financial Services By Dr. S. Gurusamy TMH.
2. Financial Services, By Nalini PRAVATRI PATHY, PHI Learning PVT Ltd.,
3. Financial Markets, Institutions & Services by NK Gupta and Monika Chopra – Anebooks Pvt Ltd., www.anebooks.com
4. Financial Services M. Y Khan, TMH.
5. Financial Markets and Institutions by Jeff Madura, India Edition, Cengage Learning.
6. Financial Services and System By K. Sasidharan and Alex K. Mathews, TMH.
7. Financial Services S. Mohan and R. Elangovan, By Deep and Deep Publication.



SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EC37			3	0	0	3

SUBJECT TITLE: INTERNATIONAL FINANCE

OBJECTIVE:

To give the students an overall view of the international financial system – instruments and markets.

COURSE OUTCOME Students shall have a fair understanding of the international financial tactics including the international trade, international investment scenario and various kinds of exposures. Students will be aware of the different kinds of foreign exchange management techniques including hedging, currency arbitrage, etc. They will be in a position to manage multinational working capital in an efficient and effective manner.

Students will also understand & manage the risks that MNCs have to deal with.

Unit I

International Financial Management: An overview, Importance, nature and scope, International Business Methods, Recent changes and challenges in IFM - History of Global Monetary Systems - Evolution and practices in Foreign Exchange Markets - International Financial Institutions

Unit II

Fundamentals of Foreign Exchange – Parity theory and conditions – Factors affecting determination of Exchange rate – Various exchange rate types.

Unit III

Exposure and Risk Management - hedging – speculation – arbitrage - internal and external techniques of hedging – derivatives – meaning – significance – types.

Unit IV

Regulatory Framework for International Finance - Short term financial management in a global set-up – treasury functions – International Taxation – Double Taxation Avoidance Agreement

Unit V

Global capital Markets: Issues, investors, intermediaries. Disintermediation, Deregulation, Securitization, Globalization. Various methods of raising resources by borrowers in International markets. Types

Bonds, Floating Rate Notes (FRNs), Deep Discount Bonds, Zero Coupon Bonds, Dual Currency Bonds, Equity related Bonds. Procedure for Bonds Issues.

Skill development

SUGGESTED READINGS:

1. Shaprio, Alan.C.:MultinationalFinancialManagement,PrenticeHall,NewDelhi
2. Apte,P.G.:InternationalFinancialManagement,TataMcGrawHill,NewDelhi
3. Buckley,Adrian:MultinationalFinance,PrenticeHall,NewDelhi
4. Eitman,D.K. andA. I.Stenehill:MultinationalBusinessCashFinance,AddisonWesley,NewYork
5. Henning,C.N.,W.PggotandW.H.Scott:InternationalFinancialManagement,McGrawHill,InternationalEdition.
6. Levi,MauriceD.:InternationalFinance,McGrawHill,InternationalEdition
7. Rodrigues,R.M.andE.E.Carter:InternationalFinancialManagement,PrenticeHall,InternationalEdition
8. Yadav, SurendraS,P. K. JainandMaxPeyrard:ForeignExchangeMarkets, MacMillan, NewDelhi
9. Zeneff,D.andJ.Zwick:InternationalFinancialManagement,PrenticeHall,InternationalEdition.
10. Sharan:InternationalFinancialManagement,PHI, NewDelhi

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EC38			3	0	0	3

SUBJECT TITLE: INSURANCE AND RISK MANAGEMENT

OBJECTIVE:

To provide the basics of insurance contracts and to explain the various types of insurance policies.

COURSE OUTCOME

Evaluate the growth and Development of Insurance Business. • Understand the working and functioning of the Insurance Sector. • Study the inter-relationship between Insurance & Risk Management. • Analyze the Role of Insurance Business Intermediaries. • Obtain an overview of Regulatory Framework of Insurance Sector

UNIT-I: Introduction to Insurance:

Insurance- Principles of Insurance- Insurance Contracts- Objectives of Insurance Contracts- Elements of a valid contract- Characteristics of Insurance Contracts. benefits and cost of insurance system

UNIT-II: Types of Insurance:

Classification of Insurance- Life Insurance - Principles - Products - General Insurance – Principles of general insurance – General Insurance Products (Fire, Motor, Health). Insurance Pricing – Insurance Market & Regulation – Solvency regulation.

UNIT- III Risk Management:

Risk - Types of Risk – Objectives of risk management – Sources of risk – Risk Identification – Measurement of risk. Understanding the cost of risk- the evolution of enterprise risk management.

UNIT-IV: Risk Management Techniques:

Risk Avoidance – Loss Control – Risk retention – risk transfer – Value of risk Management – Pooling and diversification of risk - Options – Forward contracts – Future contracts – SWAPS – Hedging – Optimal hedges for the real world.

Skill development

UNIT V Insurance as a Risk Management Technique

Insurance Principles – Policies – Insurance Cost & Fair Pricing – Expected claim costs – Contractual provisions that limit Insurance Coverage.

SUGGESTED READINGS:

1. DR.P.K.GUPTA:InsuranceandRiskManagement,1stedition,HimalayaPublishingHouse.
2. DR.P.K.GUPTA:FundamentalsoffInsurance, 1stedition,HimalayaPublishingHouse.
3. C.GopalaKrishnan:InsurancePrinciples&Practice,SterlingPublishersPvt.Ltd.,NewDelhi.4..Geo
rgeG.R.Lucas,RalphH.Wherry: INSURANCE,Principlesand Coverages,U.S.A.
5. Prof.
K.S.N.MurthyadK.V.S.Sarma:ModernLawofInsuranceInIndia,N.M.TripathiPvt.Ltd.,Bombay.
6. P.S.Palande,R.S.Shah,M.L.Lunawat:InsuranceInIndia,SagePublications,NewDelhi.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EC39		3	0	0	3

SUBJECT TITLE: CORPORATE FINANCE

OBJECTIVE:

Student will acquire Nuances involved in short term corporate financing, Good ethical practices

COURSE OUTCOME -Students are able to calculate the cost of capital, to analyze empirical data that determines risk factors; to build long-term and short-term financial models, describing the company's growth; to understand the principles of the credit policy of the company, the relationship of long-term and short-term decisions and their impact on the company's value; to perform the company's valuation based on different approaches.

UNIT I INDUSTRIAL FINANCE

Indian Capital Market– Basic problem of Industrial Finance in India. Equity – Debenture financing – Guidelines from SEBI, advantages and disadvantages and cost of various sources of Finance - Finance from international sources, financing of exports–role of EXIM bank and commercial banks– Finance for rehabilitation of sick units.

UNIT II SHORT TERM-WORKING CAPITAL FINANCE

Estimating working capital requirements – Approach adopted by Commercial banks, commercial paper- Public deposits and intercorporate investments.

UNIT III ADVANCED FINANCIAL MANAGEMENT

Appraisal of Risky Investments, certainty equivalent of cash flows and risk adjusted discount rate, risk analysis in the context of DCF methods using Probability information, nature of cash flows, Sensitivity analysis; Simulation and investment decision, Decision tree approach in investment decisions.

Skill development

UNIT IV FINANCING DECISION

Simulation and financing decision -cash inadequacy and cash insolvency-determining the probability of cash insolvency-Financing decision in the Context of option pricing model and agency costs-Inter-dependence of investment-financing and Dividend decisions.

UNIT V CORPORATE GOVERNANCE

Corporate Governance- SEBI Guidelines- Corporate Disasters and Ethics- Corporate Social Responsibility- Stakeholders and Ethics- Ethics, Managers and Professionalism.

TEXTBOOKS

1. Richard A. Brealey, Stewart C. Myers and Mohanthy, Principles of Corporate Finance, Tata McGraw Hill, 9th Edition, 2011
2. I. M. Pandey, Financial Management, Vikas Publishing House Pvt., Ltd., 12th Edition, 2012.

REFERENCES

1. Brigham and Ehrhardt, Corporate Finance- A focused Approach, Cengage Learning, 2nd Edition, 2011.
2. M. Y Khan, Indian Financial System, Tata McGraw Hill, 6th Edition, 2011
3. Smart, Megginson, and Gitman, Corporate Finance, 2nd Edition, 2011.
4. Krishnamurthy and Viswanathan, Advanced Corporate Finance, PHI Learning, 2011.

5. Website of SEBI

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		20260EC42		3	0	0	3

SUBJECT TITLE: MICROFINANCE

Objectives: To enable the student to understand the principles, practices and application in Micro Finance.

COURSE OUTCOME.

The participants would get a good understanding on the functioning of the various Micro finance models which are existing in India as well as abroad.

It seeks to develop an understanding about the MFIs and their changing role in developing the sector and how Micro Finance is being marketed in the economy.

UNIT I Introduction: Evolution: Impact and Importance: Micro Financial Services: Steps Initiated in Development of Microfinance

UNIT II Role of Regulatory body in Micro finance: Rural Credit system: Self Help groups (SHG): What is SHG: Features of SHG: Objectivity of SHG: Role of SHG in Micro finance: Self Help group promoting institutions (SHPI): Formation of SHG: Credit Linkage

UNIT III Micro Finance Services: Weaker Sections: SHG-Bank Linkage: Banks and Financial Intermediaries: SHG-Thrift, credit, and Other Financial Services

Skill development

UNIT IV Formation and development of Micro Services. Micro Finance Institutions: Role of MFI in developing Micro Finance: Enhancing Institutional Finance

UNIT V Micro Finance and Rural Development: Micro Credit Institutions: Non Government Organization (NGO). Prospects of Micro Finance: RBI Role in Regulating: Bank's Role in Micro Finance: Growth of Micro Finance: Development of Micro Finance: Credit Plans: Credit Schemes: social Banking.

Reference Books

1. Microfinance and poverty reduction by Susan Johnson and Bren Rogaly – Oxfam 1997
2. Indian microfinance-the challenges of rapid growth-by Prabughate – Sage 2007
3. Microfinance handbook-by Jonna Ledgerwood – Ebook
4. Commercial banks in microfinance-by Malcolm Harper and Sukhwinder Singh Arora – Teri Press 2005.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EC43		3	0	0	3

SUBJECT TITLE: STRATEGIC FINANCIAL MANAGEMENT

Objectives: To equip the students with necessary strategic knowledge and skills received to evaluate discussions or capital restructuring, mergers and acquisitions.

COURSE OUTCOME

Learners will recognize the current market scenario and upgrade the skills and knowledge of long-term sustainability. Learners will absorb changing scenario in Banking Sector and provide guidance towards choosing banking as a career option and also study made on financial management in banking sector. Learners will realize the contemporary issues related to financial management.

UNIT I Sale of existing assets and making discussions on complex investment opportunities and managing risk- Financial planning- Analyzing Financial Performance – Approaches to Financial Planning – Short-term Financial Planning

UNIT II Strategic Alliances- Ownership Restructuring- Leveraged Buyouts- Sell Offs- Leveraged Recapitalizations- Distress Restructuring- Merges & Acquisitions- Financial Frame Work- Merger as a Capital Budgeting Decision- Legal and Tax Aspects- Post Merger Integration Issue,

UNIT III Acquisition/ Takeover Codes- Techniques – Defensive Strategies- Cross Border Deals

Employability

UNIT IV Corporate Sickness- The Magnitude- Different interpretation of Sickness- Causes- Turnaround- Turnaround Types- Basic Approaches- Surgical Vs. Human – Phases in Turnaround Management-

UNIT V Strategy and Cost Management- Strategy Formulation and Cost System Design- Alternate Strategies- Objectives of Cost Management Systems- Broken Cost System- Causes and Remedies- Cost of Quality- Activity Based Costing principles- Target Costing.

ReferenceBooks

1. Sharplin, 'StrategicManagement,McGrawHill.
2. WestonJ.Fred&E.F. Brigham, 'ManagerialFinance', DrydonPress
3. JamesC. VanHorne, 'FinancialManagementandPolicy', PrenticeHallofIndia
4. M. Y. Khan, 'FinancialServices', TataMcGrawHill-3rdEdition
5. RichardA. BrealeyandStewartC. Myers, 'PrinciplesofCorporateFinance', TataMcGrawHill.
6. PradipM. Khandwalla, 'InnovativeCorporateTurnarounds', SagaPublications
7. G. P. Jakhotiya, 'StrategicFinancialManagement', VikasPublications

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EC44		3	0	0	3

SUBJECT TITLE: MERCHANT BANKING AND FINANCIAL SERVICES

OBJECTIVES: To enable student to Understand the modes of issuing securities, Acquire and financial evaluation technique of leasing and hire purchase.

COURSE OUTCOME

To impart knowledge regarding the components of Indian Financial System. • To provide in depth understanding of different avenues of financial system viz. capital markets, banking, insurance, mutual funds & other related services. • To enable the students to understand the role & functioning of regulatory bodies in financial sector

UNIT I MERCHANT BANKING

Introduction – An Over view of Indian Financial System – Merchant Banking in India – Recent Developments and Challenges ahead – Institutional Structure – Functions of Merchant Bank – Legal and Regulatory Framework – Relevant Provisions of Companies Act - SERA - SEBI guidelines - FEMA, etc. - Relation with Stock Exchanges and OTCEI.

UNIT II ISSUE MANAGEMENT

Role of Merchant Banker in Appraisal of Projects, Designing Capital Structure and Instruments – Issue Pricing – Book Building – Preparation of Prospectus Selection of Bankers, Advertising Consultants, etc. - Role of Registrars – Bankers to the Issue, Underwriters, and Brokers. – Offer for Sale – Green Shoe Option – E-IPO, Private Placement – Bought out Deals – Placement with FIs, MFs, FIIs, etc. Off - Shore Issues. – Issue Marketing – Advertising Strategies – NRIMarketing – Post Issue Activities.

UNIT III OTHER FEE BASED SERVICES

Mergers and Acquisitions – Portfolio Management Services – Credit Syndication – Credit Rating – Mutual Funds - Business Valuation.

UNIT IV FUND BASED FINANCIAL SERVICES

Leasing and Hire Purchasing – Basics of Leasing and Hire purchasing – Financial Evaluation.

EMPLOYABILITY

UNIT V OTHER FUND BASED FINANCIAL SERVICES

Consumer Credit – Credit Cards – Real Estate Financing – Bills Discounting – factoring and Forfeiting – Venture Capital.

TEXTBOOKS

1. M. Y. Khan, Financial Services, Tata McGraw-Hill, 12th Edition, 2012
2. Nalini Prava Tripathy, Financial Services, PHI Learning, 2011.

REFERENCES:

1. Machiraju, Indian Financial System, Vikas Publishing House, 2nd Edition, 2010.
2. J. C. Verma, A Manual of Merchant Banking, Bharath Publishing House, New Delhi,
3. Varshney P. N. & Mittal D. K., Indian Financial System, Sultan Chand & Sons, New Delhi.
4. Sasidharan, Financial Services and System, Tata McGraw Hill, New Delhi, 2nd Edition, 2011.

PRODUCTION & OPERATIONS

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260ED33			3	0	0	3

SUBJECTTITLE:PROJECTMANAGEMENTO

OBJECTIVE:

This course focuses on project management methodology that will increase the ability of students to initiate and manage projects more efficiently and effectively. Also they will learn key project management phases through an innovative model.

COURSE OUTCOME

Assumes responsibility as a professional practitioner of project management, applying PM principles and practices while maintaining high standards of practice, making ethical judgments and decisions in a respectful, and sustaining professional standing through a commitment to life-long learning

UNIT I INTRODUCTION TO PROJECT MANAGEMENT

Project Management – Definition – Goal –

Lifecycles. Project Selection Methods. Project Portfolio Process – Project Formulation. Project Manager – Roles – Responsibilities and Selection – Project Teams.

UNIT II PLANNING AND BUDGETING

The Planning Process – Work Break down Structure – Role of Multidisciplinary teams.

Budget the Project –

Methods. Cost Estimating and Improvement. Budget uncertainty and risk management.

UNIT III SCHEDULING & RESOURCE ALLOCATION

PERT & CPM Networks - Crashing – Project Uncertainty and Risk Management – Simulation –

Gantt Charts – Expediting a project – Resource loading and leveling. Allocating scarce resources

– Goldratt's Critical Chain.

UNIT IV CONTROL AND COMPLETION

The Plan-Monitor-Control cycle – Data Collecting and reporting – Project Control –

Designing the control system. Project Evaluation, Auditing and Termination.

UNIT V PROJECT ORGANISATION & CONFLICT MANAGEMENT

Project Management Information System: Computer based tools, features of PMIS, using project management software, (MS Projects). Project Evaluation, Reporting & Termination:

Project reviews & reporting, closing the contract.

SUGGESTED READINGS:

1. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 2005.

2. John M. Nicholas, Project Management for Business and Technology - Principles and

Practice, Second Edition, Pearson Education, 2006.

3. Gido and Clements, Successful Project Management, Second Edition, Thomson Learning, 2003.

4. Harvey Maylor, Project Management, Third Edition, Pearson Education, 2006.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		20260ED34		3	0	0	3

SUBJECT TITLE: PLANNING & CONTROL OF OPERATIONS

OBJECTIVE:

This course is designed to acquaint the student with the methods of planning and control for Operations. It helps to identify and discuss forecasting models in the qualitative and quantitative areas.

COURSE OUTCOME

Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness. Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments. Develop aggregate capacity plans and MPS in operation environments. Plan and implement suitable materials handling principles and practices in the operations. Plan and implement suitable quality control measures in Quality Circles to TQM.

UNIT-I

Planning & Control of Operations: Need, Functions - Routing, Scheduling, shop loading and dispatch, follow up. Relations with other departments, Routing-Process layout indicating flow Chart of material from machine to machine. Dispatch in production control-documentation.

UNIT-II

Demand Forecasting: Forecasting as a planning tool, Why do we forecast, Forecasting time horizon, Design of forecasting systems, Developing the logic of forecasting, Sources of data, Models for forecasting, Extrapolative methods using time series, Causal methods of forecasting, Accuracy of forecasts, Using the forecasting system.

UNIT-III

Aggregate Production Planning: Planning Hierarchies in operations, Aggregate Production planning, Need for Aggregate Production planning, Alternatives for managing demand, Alternatives for managing supply, Basic strategies for aggregate production planning, Aggregate production planning methods, Master Production Scheduling.

UNIT-IV

Resources Planning: Dependent Demand Attributes, Planning a framework - the basic building blocks: Multiple levels in products, Product Structure, The Bill of Materials, Time phasing of the requirements, Determining the Lot Size, Incorporating Lead time information, Establishing the planning premises. MRP Logic, Using the MRP system, Capacity Requirements planning, Manufacturing Resources Planning (MRP II), Enterprise Resource Planning (ERP), Resource Planning in services.

UNIT-V

Scheduling of Operations: Need for Scheduling, Scheduling - Alternative terms, Loading of machines, Scheduling Context, Scheduling of Flow Shops, Scheduling of Job Shops, Input-Output Control, Operational Control Issues in Mass production systems.

SUGGESTED READINGS:

1. Operations Management: Theory and Practice by B Mahadevan, Pearson, 2nd Edition.
2. Operations Management by Terry Hill, Palgrave, 2nd Edition
3. The fundamentals of Production Planning and Control by Stephen Chapman, Pearson, 1st Ed.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260ED35			3	0	0	3

SUBJECT TITLE: TECHNOLOGY MANAGEMENT

OBJECTIVE:

This course helps to understand the dynamics of technological innovation and be familiar with how to formulate technology strategies.

COURSE OUTCOME- Apply Measurement And Analytical Tools To Improve Process Systems
 Apply Measurement And Analytical Tools To Increase The Quality Of Products And/Or Services
 Provide Leadership, Guidance, And Assistance To Coworkers When Implementing Changes
 Understand The Financial And Legal Workings Of Organizations.

UNIT-I

Introduction

Definition, Characteristics of Technology, Role and Importance of Management of Technology - Technological Environment - Levels of Environment - Changes in the Technological Environment, Major Developments in Technological Environment.

UNIT-II

Innovation Management: Concept of Innovation; invention and creativity, Drivers and process of innovation - Classification of innovation management of innovation. Technology Evolution -

Technology progression, Technology change agents, Evolutionary characteristics of technological change - Drivers of Change in Value Chain, Modes of Value Chain Configuration, Value Chain Configuration and Organizational Characteristics

UNIT-III

Technological Forecasting: Meaning of Technology forecasting, uses of Technology forecasting, Technology forecasting techniques: Exploratory and Normative technique; Process and application of techniques like Delphi, Growth Curves, S- curve, Pearl Curve, Gompertz curve :Relevance Tree, Morphological Analysis, Mission Flow Diagram

UNIT- IV

Technology and Competition

Competitive Consequences of Technological Change, Technological Characteristics of Competitive Domains, Dynamics of Change in Competitive Domains - Technology Intelligence - Technology Strategy

UNIT-V

Technology and Organizational Issues: Technological change and Industrial Relations, Technology Assessment and Environmental Impact Analysis Integration of People and Technology, Organizational and Psychological Factors, Organizational Structure.

SUGGESTED READINGS:**1. Managing**

Technology and Innovation for Competitive Advantage, V.K. Narayanan, Pearson Education.

2. Managing Technology – The Strategic View, Lowell W. Steele, McGraw Hill.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260ED36			3	0	0	3

SUBJECT TITLE: LOGISTICS MANAGEMENT**OBJECTIVE:**

The objective of this course is to get the exposure of logistics management and to understand the relationship between the logistics and packaging.

COURSE OUTCOME

learn logistics concepts and basic activities

Know the history of Logistics.

Define basic logistics activities.

Associate logistics activities with other business activities.

UNIT-I: Introduction to Logistics and Competitive Strategy

Definition and Scope of Logistics – Functions and Objectives – Customer Value Chain – Service Phases and Attributes – Value Added Logistics Services – Role of Logistics in Competitive Strategy.

UNIT- II: Warehousing and Materials Handling

Warehousing Functions – Types – Site Selection – Decision Model – Layout Design – Costing – Virtual Warehouse. Material Handling equipment and Systems – Role of Material Handling in Logistics. Material Storage Systems – Principles – Benefits – Methods. Automated Material Handling.

UNIT-III: Performance Measurement and Costs

Performance Measurement –

Need, System, Levels and Dimensions. Internal and External Performance Measurement. Logistics Audit. Total Logistics Cost – Concept, Accounting Methods. Cost – Identification, Time Frame and Formatting.

EMPLOYABILITY**UNIT- IV: Transportation and Packaging**

Transportation System – Evolution, Infrastructure and Networks. Freight Management – Route Planning – Containerization. Modal Characteristics, Inter-Modal Operators and Transport Economies. Packaging – Design considerations, Material and Cost. Packaging as Unitization – Consumer and Industrial Packaging.

UNIT- V: Current Trends

Logistics Information Systems – Need, Characteristics and Design. E-Logistics – Structure and

Operation. Logistics Resource Management. Automatic Identification Technologies. Warehouse Simulation. Reverse Logistics – Scope, Design and as a Competitive Tool. Global Logistics – Operational and Strategic Issues. Strategic Logistics Planning.

SUGGESTED READINGS:

1. Douglas M Lambert et al, Fundamentals of Logistic Management, McGraw Hill, 1997.
2. Sople Vinod V, Logistics Management – The Supply Chain Imperative, Pearson Education, Indian Reprint 2004.
3. Ronald H Ballou, Business Logistic Management, PHI, 2005.
4. Benjamin S Blanchard, Logistic Engineering and Management, Pearson Education, 2009.
5. Bloomberg David Jetal., Logistics, Prentice Hall India, 2005.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		20260ED37		3	0	0	3

SUBJECT TITLE: SUPPLY CHAIN MANAGEMENT

COURSE OUTCOME

Develop a sound understanding of the important role of supply chain management in today’s business environment. Become familiar with current supply chain management trends Understand and apply the current supply chain theories, practices and concepts utilizing case problems and problem-based learning situations

OBJECTIVE:

The objective of this course is to get the exposure of supply chain management and to understand the relationship between the procurement and supply chain management.

UNIT- I: Introduction

Supply Chain – Fundamentals, Importance, Decision Phases, Process View. Supplier – Manufacturer – Customer Chain. Drivers of Supply Chain Performance. Structuring Supply Chain Drivers. Overview of Supply Chain Models and Modeling Systems.

UNIT-II: Strategic Sourcing

In-sourcing and Out-sourcing – Types of Purchasing Strategies. Supplier Evaluation, Selection and Measurement. Supplier Quality Management. Creating a world class Supply Base. World Wide Sourcing.

UNIT- III: Supply Chain Network

Distribution Network Design – Role, Factors Influencing, Options, Value Addition. Models for Facility Location and Capacity Location. Impact of uncertainty on Network Design. Network Design Decisions Using Decision Trees. Distribution Center Location Models. Supply Chain Network Optimization Models.

EMPLOYABILITY

UNIT-IV:PlanningDemand,InventoryAndSupply

Overview of Demand Forecasting in the Supply Chain. Aggregate Planning in the Supply Chain. Managing Predictable Variability. Managing Supply Chain Cycle Inventory. Uncertainty in the Supply Chain – Safety Inventory. Determination of Optimal Level of Product Availability. Coordination in the Supply Chain.

UNIT- V:CurrentTrends

E-Business – Framework and Role of Supply Chain in e-Business and B2B Practices. Supply

ChainITFramework.InternalSupplychainmanagement.FundamentalsofTransactionManagement. Supply Chain in IT Practice. Supplier Relationship Management. InformationSystemsDevelopment.PackagesinSupplyChain– eSRM,eLRM,eSCM.SupplyBaseManagement.

SUGGESTED READINGS:

1. SunilChopraandPeterMeindi,SupplyChainManagement– StrategyPlanningandOperation,PearsonEducation,ThirdIndianReprint,2004.
2. Monczkaetal.,PurchasingandSupplyChainManagement,ThomsonLearning,Secondedition,SecondReprint,2002.
3. Shapiro JeremyF,ModelingtheSupplyChain,2ndEdition,ThomsonLearning,2002.
4. JanatShah, SupplyChainManagementTextandCases,Pearson2009
5. RPMohantyandSGDeshmukh,SupplyChainManagementTheoryandPractices,Biztantra,2009.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260ED38			3	0	0	3

SUBJECT TITLE: BUSINESS PROCESS REENGINEERING

OBJECTIVE:

The objectives of this course are to acquaint the student with understanding process orientation in business management and develop skills and abilities in re-engineering and business process for optimum performance.

COURSE OUTCOME

Understanding various BPR methodologies and their applications. Understanding the critical success factors for implementing BPR. Appreciate various alternative techniques of BPR – TQM, Work Study, Benchmarking and their applications. Basic understanding of ISO standard 9001:2015, IACBE and their applications in education and industry. Analyze and integrate issues and challenges of applying tools/techniques of Information Technology for BPR and learn to apply them in the industry.

UNIT-I

Introduction to Business Process Reengineering (BPR): Definition of business process-History, Basics, Definition, Emergence of BPR, The need for reengineering, Benefits of BPR, Role of leader & manager, Breakthrough reengineering model, BPR guiding principles, Business process reengineering & performance improvement, Key targets of BPR.

UNIT-II

BPR in Manufacturing Industry: Introduction, Enablers of BPR in manufacturing Agile Manufacturing, Lean Manufacturing, JIT, Collaborative Manufacturing, Intelligent Manufacturing, Production Planning, Product design & development.

UNIT-III

BPR & Information Technology: Introduction, Relationship between BPR & Information Technology, Role of Information Technology in reengineering, Role of IT in BPR (with practical examples), Criticality of IT in business process, BPR tools & techniques, Enablers of process reengineering, Tools to support BPR, Future role of IT in reengineering.

UNIT-IV

BPR implementation methodology: Reasons of implementation of BPR, Necessary attributes, BPR team characteristics, BPR methodology, Different phases of BPR, BPR model, Common steps to be taken for BPR implementation, Steps of process reengineering, Organizational redesign using BPR, Impact of BPR on organizational performance, Performance measures of BPR, Business process reengineering project management,

EMPLOYABILITY

UNIT-V

Success factors and Managing barriers of BPR: Reengineering success factors, Critical success factors of BPR, Reasons for BPR project failure & success, Reengineering drives cause many changes- Potential project implementation success, Risks associated with business process reengineering projects, Business process reengineering implementation barriers, Information Technology barriers, A framework for barrier management.

SUGGESTED READINGS:

1. Business Process Reengineering by Radhakrishnan, Balasubramanian, PHI, Eastern Economy Edition, 2008.
2. Business Process Reengineering by Jayaraman, Ganesh Natrajan and Rangaramanujan, TMGH
3. Business Process Reengineering and Change Management by Dey, Biztantra

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260ED39			3	0	0	3

SUBJECT TITLE: MATERIALS MANAGEMENT

OBJECTIVE:

To understand the working of a materials management department, Aspects of Stores management, Warehousing management and material requirement planning.

COURSE OUTCOME

Identifying the scope for integrating materials management function over the logistics and supply chain operations. Integrate the organization wide materials requirement to develop an overall plan (MRP). Identify, study, compare, and evaluate alternatives, select and relate with a good supplier. Apply various purchasing method and inventory controlling techniques into practice. Analyzing the materials in storage, handling, packaging, shipping distributing and standardizing.

UNIT – I Dynamics of material management , Level of material management, Scope, Objective, Importance–Integrated material managements–System approach to material managements

UNIT–II Warehousing management, purchasing cycle, material handling

UNIT–

III Vendor rating, contract management. Legal aspects of buying spare parts management, material requirement planning, .

EMPLOYABILITY

UNIT – IV Capacity management, Forecasting, Product & Processes, Just-in-time manufacturing, TQM, Incoming, Material quality.

UNIT–V Cost-

effectiveness & performance management, material management, Information system, stores management, material management

Referencebooks

1. J.R.TonyArnold&StephenN.Chapman,IntroductiontoMaterialsManagement,PearsonEducation Inc,2001.
2. P.Gopalakrishnan,PurchasingandMaterialsManagement, TataMcGrawHill PublishingCompanyLimited,NewDelhi,2001.
3. P.Gopalakrishnan&M.Sundaresan,MaterialManagementanIntegratedApproach,Prentice –HallofIndiaPrivateLimited,NewDelhi,2001.
4. A.K.Datta,MaterialsManagement,InventoryControlandLogistics,JaicoPublishinghouse,Mumbai,2001.
5. A.K.Datta,Materials ManagementProcedures,TextandCases, Prentice-HallofIndiaPrivateLimited,NewDelhi,2001.
6. P.Gopalakrishnan&A.K.Banergi,MaintenanceandSparePartsManagement,PrenticeHallofIndiaPrivateLimited,NewDelhi,2001

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260ED42		3	0	0	3

SUBJECTTITLE:MAINTENANCEMANAGEMENT

OBJECTIVE:

Toenablethestudentstounderstandtheprinciples,practices andapplicationsinMaintenanceManagement.

COURSE OUTCOME

To present modern basic maintenance theory, especially related to industrial challenges within terminnology, maintenance management, concepts, indicators, CMMS, modern analyses within maintenance and maintenance optimization.

UNIT – I Objectives, Importance of Maintenance- Roles and responsibilities of maintenance professionals

UNIT–II Safety management-Productivity and maintenance. Scheduled maintenance–preventive maintenance–predictive maintenance–planned maintenance–corrective maintenance routine maintenance–inspection, lubrication, calibration and maintenance quality.

UNIT–III Typical causes of BDM-disadvantages- maintenance as a perspective of asset EMPLOYABILITY

management- Total Productive Management –Contract maintenance – Breakdown history and other maintenance records

UNIT – IV Technical and financial factors for replacement – Methods of replacement analysis salvaging spare parts procurement

UNIT–V warehousing and logistics management. Emerging trends in maintenance management – Global scenario-Indian experience – need for maintenance training – Managing obsolescence.

References:

1. Maintenance and spares Parts management – PGopalakrishnan & AK Banerji. Prentice Hall of India, 2007
2. Industrial Engineering and Management- OP Khanna. Dhanpat Rai & Sons, 2008

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260ED43			3	0	0	3

SUBJECT TITLE: SERVICE OPERATIONS MANAGEMENT

OBJECTIVE:
To help understand how service performance can be improved by studying service operations management

COURSE OUTCOME
Implement statistical methods and management techniques to monitor, control and improve service processes of an organisation. Propose solutions with which a service organisation can improve its operations and achieve sustainable competitive advantage.

UNIT I INTRODUCTION Services – Importance, role in economy, service sector – growth; Nature of services – Service classification , Service Package, distinctive characteristics , open-systems view; Service Strategy – Strategic service vision, competitive environment, generic strategies, winning customers; Role of information technology; stages in service firm competitiveness; Internet strategies – Environmental strategies.

UNIT II SERVICE DESIGN New Service Development – Design elements – Service Blue-printing - process structure – generic approaches – Value to customer; Retail design strategies – store size – Network configuration ; Managing Service Experience – experience economy, key dimensions; Vehicle Routing and Scheduling

UNIT III SERVICE QUALITY Service Quality-Dimensions, Service Quality Gap Model; Measuring Service Quality – SERVQUAL- Walk-through Audit; Quality service by design - Service Recovery - Service Guarantees; Service Encounter – triad, creating service orientation, service profit chain; Front-office Back-office Interface – service decoupling.

UNIT IV SERVICE FACILITY Service gaps – behaviour – environmental dimensions – framework; Facility design – nature, objectives, process analysis – process flow diagram, process steps, simulation; Service facility layout; Service Facility Location – considerations, facility location techniques – metropolitan metric, Euclidean, centre of gravity, retail outlet location, location set covering problem

UNIT V MANAGING CAPACITY AND DEMAND Managing Demand – strategies; Managing capacity – basic strategies, supply management tactics, operations planning and control; Yield management; Inventory Management in Services – Retail Discounting Model, Newsvendor Model; Managing Waiting Lines – Queuing systems, psychology of waiting; Managing for growth – expansion strategies, franchising, globalization.

SKILL DEVELOPEMNT

TEXTBOOKS

1. James A. Fitzsimmons, Service Management – Operations, Strategy, Information Technology, Tata McGraw-Hill – 5th Edition 2006.
2. Richard Metters, Kathryn King-Metters, Madeleine Pullman, Steve Walton Successful Service Operations Management, South-Western, Cengage Learning, 2nd Edition

REFERENCES

1. Cengiz Haksever, Barry Render, Roberta S. Russell, Robert G. Murdick, Service Management and Operations, Pearson Education – Second Edition.
2. Robert Johnston, Graham Clark, Service Operations Management, Pearson Education, 2nd Edition, 2005.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		20260ED44		3	0	0	3

SUBJECT TITLE: PRODUCT DESIGN

OBJECTIVE:

To help understand the application of structured methods to develop a product. Student gains knowledge on how a product is designed based on the needs of a customer.

COURSE OUTCOME

- Use the Product Design and Development Process, as a means to manage the development of an idea from concept through to production.
- Employ research and analysis methodologies as it pertains to the product design process, meaning, and user experience.

- **Apply creative process techniques in synthesizing information, problem-solving and critical thinking.**

UNIT I INTRODUCTION: Defining Product, Types of products. Product development – characteristics, duration and cost, challenges. Development Process: Generic Process- Adapting to product types. Evaluation – decay curve – cost expenditure curve.

UNIT II PRODUCT PLANNING: Product Planning Process – Steps. Opportunity identification – breakdown structure- product development charter. Product Life Cycle. Technology Life Cycle - Understanding Customer Needs - Disruptive Technologies- Product Specification - Concept Generation – Activity-Steps-Techniques.

UNIT III PRODUCT CONCEPT Selection – Importance, Methodology, concept Screening, Concept Scoring. Concept Testing. Product Architecture- Definition, Modularity, implication, Establishment, Delayed Differentiation, Platform Planning.

UNIT IV INDUSTRIAL DESIGN AND DESIGN TOOLS Industrial Design, Design for Manufacturing- Value Engineering- Ergonomics- Prototyping- Robust Design- Design for X-failure rate curve- product use testing- Collaborative Product development- Product development economics- scoring model- financial analysis.

UNIT V PATENTS Defining Intellectual Property and Patents, Patent Searches and Application, Patent Ownership and Transfer, Patent Infringement, New Developments and International Patent Law.

SKILL DEVELOPMENT

TEXTBOOKS

1. Karl T. Ulrich, Steven D. Eppinger, Anita Goyal Product Design and Development, Tata McGraw-Hill, Fourth Edition, reprint 2009.
2. Kenneth B. Kahn, New Product Planning, Sage, 2010.

REFERENCES

1. A. K. Chitale and R. C. Gupta, Product Design and Manufacturing, PHI, 2008.
2. Deborah E. Bouchoux, Intellectual Property Rights, Delmar, Cengage Learning, 2005.
3. Anil Mital. Anoop Desai, Anand Subramanian, Aashi Mital, Product Development, Elsevier, 2009.
4. Michael Grieves, Product Life Cycle Management, Tata McGraw Hill, 2006.
5. Kerber, Ronald L., Laseter, Timothy M., Strategic Product Creation, Tata-McGraw Hill, 2007.

LOGISTICS AND SUPPLY CHAIN MANA GEMENT

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE33		3	0	0	3

SUBJECT TITLE: PURCHASING AND PROCUREMENT MANAGEMENT

OBJECTIVE:

The objective of this module is to provide the students with a good knowledge on purchase function of the organization, material planning, source selection and negotiation techniques.

COURSE OUTCOME

Understand the basic concepts of Purchasing & Supplier Relationship Management. To understand the purchasing integration for competitive advantage Learn the basics of strategic sourcing & it's the issues, challenges & strategies in developing a World Class Supply Base: Supplier Evaluation and Development Understand basics of strategic sourcing process & its application

UNIT I The role of Purchase in business, Objectives, Relationship of purchasing department with Other Departments, Profit Centre Concept, Partnership Sourcing, Network Sourcing, Benchmarking, Buying Decision Models, Purchasing Market Research, Role of Information Technology in Purchasing and the Portfolio of Purchasing Skills.

UNIT II Materials Planning, Materials Codification: Evolution of Codes, Classification, Methodology, Advantages. Standardization: Definition, Specification, Advantages, Techniques. Value Analysis: Concept, Organization for Value Analysis, Application, Techniques, Steps for Value Analysis.

UNIT III Supply Sources: Importance of Source Selection, Vendor Development & Maintenance, Vendor Rating, Competitive Bidding, Selecting the Source. Pricing Principles: Economic Consideration in Determining the Right Price, Price Analysis, Discounts. Cost Analysis: Elements of Affecting Costs, Sources of Cost Data, Direct & Indirect Costs, Target Costing.

UNIT IV Purchasing capital equipment – contract buying, retail buying, engineering and construction contracting, state and institutional purchasing, international buying, negotiations. Purchasing Environment: Changes in Environmental Conditions, Strategic Purchasing Management.

SKILL DEVELOPMENT

UNIT V Negotiation: Objectives, Process, Techniques, Price Negotiation Contract Management. Import Substitution Public Buying Traffic: Transportation Cost, Shipping Terms, Modes of Transportation, Loss and Damage of Freight, Demurrage, Transportation Strategy and Cost reduction.

SUGGESTED READINGS:

1. Dobler & Burt: Purchasing & Supply Management
2. P. Gopala Krishan: Purchasing & Materials Management
3. L.N. Aggarwal & Parag Diwan: Management & Production Systems
4. N.G. Nair: Production & Operations Management



SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE34		3	0	0	3



SUBJECT TITLE: MATERIAL MANAGEMENT

OBJECTIVE:

The aims of the course are to make the students familiar, understand and realize the importance of effective materials management to an organization's survival and profitability. Also, they learn about the major activities of materials management and linkages between one another.

COURSE OUTCOME

Identifying the scope for integrating materials management function over the logistics and supply chain operations. Integrate the organization wide materials requirement to develop an overall plan (MRP). Identify, study, compare, and evaluate alternatives, select and relate with a good supplier. Apply various purchasing method and inventory controlling techniques into practice. Analyzing the materials in storage, handling, packaging, shipping distributing and standardizing.

UNIT I: Material management: objectives, evolution, strategies, functions of material management, organization structures in material management, role of material management techniques in improved material productivity.

UNIT II: Material planning: objectives, material requirement planning, manufacturing resource planning, JIT production planning, strategic material planning, material control: acceptance, sampling, inspection, make or buy decisions, economic analysis, break even analysis, breakeven point theory, whether to add or drop product line, product explosion.

UNIT III: Purchasing: importance of good purchasing system, organization of purchasing functions, purchase policy and procedures, responsibility and limitations, purchasing decisions, purchasing role in new product development, role of purchasing in cost reduction, negotiations and purchase, purchasing research: identification of right sources of supply, vendor rating, standardization, vendor certification plans, vendor and supply reliability, developing new source of supply.

UNIT IV: Cost reduction: cost control v/s cost reduction, price analysis, material cost reduction techniques, variety reduction, cost reduction and value improvement, techniques of cost control, standard costing, cost effectiveness, cost analysis for material management, material flow cost control.

SKILL DEVELOPMENT

UNIT V: Inventory Management: Stages; Selective Control; Demand Forecasting; Lead time; Safety Stock; Fixed Quantity Reorder System; Fixed Period Reorder System; Inventory Valuation. Warehousing and Transportation: Warehouse Location; Transportation; Receiving, Issuing and Store Keeping.

SUGGESTED READINGS:

1. Materials Management, Gopal Krishna & Sudarsan, TMH
2. Materials Management- Procedures, Texts & Cases, A. K. Dutta, Pearson
3. Handbook of Materials Management – Gopal Krishnan – PHI
4. Inventory Control and Management – Waters – Wiley
5. Procurement Principles & Mgt. – Bailey/Farmer/Crocker/Jessop – Pearson

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE35		3	0	0	3



SUBJECT TITLE: INVENTORY MANAGEMENT

OBJECTIVE:

The objective of this module is to provide the students with a good knowledge on corporate business communication channel, hierarchy and the report writing methodologies.

COURSE OUTCOME

comprehend the dynamics of inventory management's principles, concepts, and techniques as they relate to the entire supply chain (customer demand, distribution, and product transformation processes), 2. understand the methods used by organizations to obtain the right quantities of stock or inventory, 3. familiarize themselves with inventory management practices.

Unit II Inventory – Inventory Management - Inventory Control - Importance & Scope of Inventory Control - Types of Inventory - Costs Associated with Inventory – Organizational setup for inventory management.

Unit II Selective Inventory Control - Economic Order Quantity - Safety Stocks - Inventory Management Systems - Forecasting Techniques - Material Requirement Planning and execution – Ratio Analysis on Inventory - Profit Margin.

Unit III Manufacturing Planning (MRP-II) - Just in Time (JIT) - Work in Process Inventories - Make or Buy Decisions: Concept of outsourcing, Factors influencing Make Or Buy Decisions - Trends in Make Or Buy Decisions in context of core competency.

Unit IV Purpose of Inventory - Goods – Types of Goods - Finished Goods Inventories - General Management of Inventory – Stocks – Types of Stocks – Tracking the Paper Life.

SKILL DEVELOPMENT

Unit V Spare Parts Inventories - Use of Computers in Inventory Management - Evaluation of Performance of Materials Function - Criteria and methodology of evaluation.

SUGGESTED READINGS:

1. Inventory Management: By Bose & D Chandra, 1st edition.
2. Sridhara Bhat, Inventory Management, 2nd edition.
3. Zipkin, Foundations of Inventory Management, McGraw Hill 1st edition.
4. Seetharama L Narasimhan, Dennis W McLeavy, Peter J Billington, Production Planning and Inventory Control, Prentice Hall of India
5. J.R. Tony Arnold, Stephen N Chapman, Introduction to materials management, Prentice Hall of India 3rd edition.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE36		3	0	0	3

SUBJECT TITLE: SUPPLY CHAIN MANAGEMENT

OBJECTIVE:

At the end of the subject, the students will be able to analyze an existing supply chain of a company, apply various supply chain management concepts, and improve the supply chain and design an efficient supply chain in alignment with the strategic goals of the company.

COURSE OUTCOME

- Develop a sound understanding of the important role of supply chain management in today's business environment
- Become familiar with current supply chain management trends Understand and apply the current supply chain theories, practices and concepts utilizing case problems and problem-based learning situations
- Learn to use and apply computer-based supply chain optimization tools including the use of selected state of the art supply chain software suites currently used in business

UNIT I The concept of Supply Chain Management - The Supply Chain Revolution - Extended organization - Integrative Management – Responsiveness – Financial Sophistication – Globalization - Digital Business Transformation.

UNIT II Building Blocks of a Supply Chain Network – Performance Measures – Decisions in the Supply Chain World – Models for Supply Chain Decision-making – Economic Order Quantity Model – Reorder Point Model.

UNIT III Supply Chain Process - Supply Chain Planning – Supply Chain Facilities Layout- Capacity Planning – Inventory Optimization – Dynamic Routing and Scheduling.

UNIT IV E-procurement – E-Logistics – Internet Auctions – E-Markets - E-commerce advantages and disadvantages for SCM – EDI – Exchanges, hubs and marketplaces – ERP.

UNIT V Evolution of world class supply chains - Global Supply Chain Integration- Supply Chain Security- International Sourcing.

SKILL DEVELOPMENT

SUGGESTED READINGS:

1. Supply Chain Logistics Management - Bowersox, Closs & Cooper - McGraw-Hill, 2nd Indian ed.
2. World Class Supply Management - Burt, Dobbler, Starling, TMGH, 7th ed.
3. Designing and Managing the supply chain - David Simchi, Levi & Philip Kaminski, McGraw-Hill Companies Inc., 2000.
4. Y. Narahari and S. Biswas. Supply Chain Management: Models and Decision Making.
5. Ram Ganeshan and Terry P. Harrison. An Introduction to Supply Chain Management.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE37		3	0	0	3

SUBJECT TITLE: LOGISTICS MANAGEMENT

OBJECTIVE:

The course outlines the historical background of Logistics Management. It is intended to prepare students to acquire knowledge and skills that lead them to fill management and analysis positions that will enable them to focus on the processes and systems of Logistics Management.

COURSE OUTCOME

learn logistics trends

- Know the third, fourth and fifth party logistics.
- Explain the reverse logistics concept.
- Know the relationship between logistics and supply chain.
- Know the global logistic concept.

UNIT I Logistics – Objectives, Components, Significance - The Logistical Value Proposition- The Work Of Logistics-Logistical Operating Arrangements - Supply Chain Synchronization – Logistic fields - The Quality Imperative -Procurement– Manufacturing– Logistics Outsourcing– Logistics Automation.

UNIT II Inventory Functionality and Definitions - Inventory Carrying Cost - Planning Inventory - Managing Uncertainty-Inventory Management Policies-Inventory Management Practices.

UNIT III Strategic Warehousing- Warehousing Operations -Warehousing Ownership Arrangements- Warehouse Decisions.

EMPLOYABILITY

UNIT IV Transport Functionality, Principles and Participants - Transportation Service - Transportation Economic and Pricing-Transport Administration –Documentation.

UNIT V Packaging Perspectives - Packaging For Materials Handling Efficiency – Principles of Material Handling System-Materials Handling Equipments–Safety Issues.

SUGGESTED READINGS:

1. Harrison, A. and R van Hoek (2005). Logistics Management and Strategy (2nd Edition) Prentice Hall.
2. Muller, M. (2003), Essentials of inventory management, American Management Association, NY 10019

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE38		3	0	0	3

SUBJECT TITLE: CUSTOM HOUSE PRACTICE AND LEGALITIES

OBJECTIVE:

This subject deals with the business transaction with the Customs and Central Excise for successfully executing an Import or Export transaction. This deal with various rules and regulations and schemes adopted by the Indian Customs as per the directions of the Ministry of Finance and provides an opportunity for the student to get a job opportunity in a CUSTOM HOUSE AGENCY.

COURSE OUTCOME

Explain the concepts in custom clearance in international business with respect to foreign trade CO2. Apply the current custom clearance phenomenon and to evaluate the global business environment in terms of economic, social and legal aspects CO3. Analyse the principle of international business and strategies adopted by firms to for exporting products globally CO4. Integrate concept in custom clearance concepts with functioning of global trade

UNIT I: Role of Customs - Powers of Customs - Custom House Agent - Custom house agents duties - Licensing of Custom House Agents - Restrictions of Custom House Agents - Customs Power to bring a ceiling on the License - Temporary and regular license - Customs Power to Advise fees chargeable by Custom House Agent.

UNIT II: Import Bill Processing - Important Papers for filing Bill of Entry - Apprising - Open Inspection - Payment of Duties - Out of Charge - Clearance of goods - payment of duties - Duty exemption - Bonding of Cargo - Exbonding.

UNIT III: Export Bills - Important papers for filing Shipping Bills - Factory Stuffing - Port or CFS Stuffing - Supervision by Customs - Sealing and print out - Custom officer overtime - Importance of Shipping Bill - Comparison of Shipping Bill with Mate's Receipt and Bills of Lading.

EMPLOYABILITY

UNIT IV: Duties and Obligations - Liabilities of Custom house agents - Custom house agent and Information Technology - ICE GATE and On line filing of Bills - Records to be maintained by Custom House Agents .

UNIT V: Custom House Licensing - Certification and Qualifications to become a Custom House Agent - Rule 8 - G Card - Identity to enter Custom Houses - Power of Customs to cancel the License of a CHA - Draw backs and Duties - Support of CHA to Importers and Exporters.

SUGGESTED READINGS:

1. Handbook of Procedure of Exim Policy 1997-2002.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
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COURSECODE	20260EE39	3	0	0	3
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SUBJECT TITLE: EXPORT TRADE AND DOCUMENTATION

OBJECTIVE:

The objective of this module is to provide the students with a good knowledge on Export trade, types of trades, formalities of trade, legalities of export trade and the documentation process of it.

COURSE OUTCOME

Explain the concepts in trade documentation in international business with respect to foreign trade Apply the current business phenomenon and to evaluate the global business environment in terms of economic, social and legal aspects Analyse the principle of international business and strategies adopted by firms to expand globally Integrate concept in international business concepts with functioning of global trade

Unit I Exporting Preliminary Consideration -Generation of Foreign enquiries, obtaining local quotation & offering to overseas buyers scrutinizing export order, opening L/C by buyers -Export Controls and Licenses -Patent, Trade Mark, Copy Right Registrations -Confidentiality and NDA.

Unit II Export Sales - Selling and Purchasing - Consignment - Leases - Marine and Air Causality Insurances - Export Finance - Forex - Major currencies, Exchange rates, relations & impact - Export costing and pricing & Incoterms -Export License -Import License.

Unit III Export Packaging - Preparation of pre shipment documentation - Methods of Transportation - Country of Origin Marking- Inspection of Export consignment - Export by Post, Road, Air & Sea - Claiming for Export benefits and Duty drawbacks.

EMPLOYABILITY

Unit IV Shipment & Shipping documents - Complicated problems in shipments & negotiation of shipping documentations - Corporate marketing strategies - 100% EOU & Free trade zone - Deemed Export - Isolated Sales Transactions.

Unit V Acts for export/import - Commencement - Customs Formalities - Export Documentation - Export of Services - Export of Excisable Goods - Import Documentation - Clearance - 100% export oriented units - custom house agents - import of different products - import/export incentives - import licenses etc.

SUGGESTED READINGS:

1. Export and Import Procedures and Documentations - Thomas E Johnson and Donna L Bade - 4th Edition.
2. Export Import Procedures - Documentation and Logistics, Publisher: New Age International, Shri C Rama Gopal, Chartered Accountant.
3. Export Import Management, Justin Paul & Rajiv Aserkar.
4. Export Management, PK Khurana

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE42		3	0	0	3

SUBJECT TITLE: QUALITY MANAGEMENT

OBJECTIVE:

The objective of this module is to provide the students with a good knowledge and importance of quality concept, quality culture, quality control and organizations for quality. It also incorporates the Managerial reasoning and analyzing in order to derive an appropriate course of action by focusing quality in products and services.

COURSE OUTCOME

To realize the importance of significance of quality Manage quality improvement teams Identify requirements of quality improvement programs

UNIT I Quality-

Concepts, Role of Quality in Changing Business Conditions, Contribution of Deming, Juran, Philip Crosby, Kaizen and Continuous Improvement, Tradeoff between Quality Costs and Schedules, Quality Costs and its Analysis, Life Cycle Costs, Quality Problems and Causes.

UNIT II Pareto Analysis, Ishikawa Cause and Effect Diagnosis. Quality Control - Control of Quality, quality control techniques, Statistical Process Control, Control Charts, Acceptance Sampling.

UNIT III Strategic Quality Management, Quality Management in Marketing, Quality Management in Designing, Quality Management in Manufacturing, Quality Management in Suppliers, Quality Management System.

EMPLOYABILITY

UNIT IV Total Quality Management - Concepts, Organization for Quality, Developing a Quality Culture. Quality Certification- Quality Assurance, ISO 9000 Series Concepts and Procedure - Six Sigma, Certification Requirements - Standards for Quality.

UNIT V Introduction to Benchmarking - Quality Function Deployment - Quality Circle - Quality Awards.

SUGGESTED READINGS:

1. Juran, J.M. & Gryna, P.M. Quality Planning & Analysis
2. James Evans and William M. Lindsay, The Management and Control of Quality, Thomson Learning, 5th edition, 2002.
3. Narayana V and N. Sreenivasan, Quality Management - Concepts and Tasks, New Age International, 1996.
4. Shailendra Nigam, Total Quality Management, Excel Books, New Delhi.
5. Feigenbaum, A. V. "Total Quality Management, McGraw-Hill, 1991

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE43		3	0	0	3

SUBJECT TITLE: AIRCARGO LOGISTICS MANAGEMENT**OBJECTIVE:**

The objective of this module is to provide the students with a good knowledge of airfreight operations, services and management that can support them in various business functions and roles such as operations, customer service, account management and sales.

COURSE OUTCOME

Understand concept of freight forwarding and air cargo. 2. Understand the process involved in air cargo management. 3. Quote the rates for transfer to air cargo from origin to the destination.

Unit I Introduction to Airline Industry - History - Regulatory Bodies - Navigation systems – Air Transport System – Management – Operations – Civil Aviation - Safety and Security - Aircraft operator's security program – ICAO security manual - Training and awareness – Rescue and fire fighting - Industry regulations - Future of the Industry.

Unit II Introduction to Air Cargo: Aviation and airline terminology - IATA areas - Country – Currency – Airlines - Aircraft lay out - different types of aircraft - aircraft manufacturers - ULD - International Air Routes - Airports - codes – Consortium – Hub & Spoke – Process Flow.

Unit III Standardization in Logistics - Air freight Exports and Imports - Sales & Marketing , Environment, Marketing Research, Strategies and Planning, Audits, Segmentation, SWOT, Marketing Management Control, Consignee controlled cargo – Sales leads – Routing Instructions - Customer service, Future trends..

EMPLOYABILITY

Unit IV Advices – Booking - SLI – Labeling – Volume/ Weight Ratio – Shipment Planning - TACT – Air Cargo Rates and Charges - Cargo operations - Cargo Operations process - Customs clearance.

Unit V Air Freight Forwarding: Air freight Exports and Imports - Special Cargoes - Consolidation - Documentation - Air Way Bill (AWB) – Communication – Handling COD shipments – POD – Conditions of contract - Dangerous (DGR) or Hazardous goods.

SUGGESTED READINGS:

1. Air transport logistics by Simon Taylor (Hampton)
2. Air cargo distributions: a management analysis of its economic and marketing benefits/[by] Paul Jackson and William Brackenridge (Gower Press)
3. Air freight: operations, marketing and economics/(by) Peter S. Smith (Faber)
4. 4th Party Cyber Logistics for Air Cargo by Sung Chi-Chu (Boston: Kluwer Academic Publishers)
5. Accelerated Logistics by Mark Wang (Santa Monica CA)
6. Airports; some elements of design and future development - John Walter Wood
7. Fundamental of air transport management by P.S. Senguttavan.
8. Oxford ATLAS - OXFORD PUBLISHING
9. Aviation century: wings of change - A global survey - Ratandeep Singh - Jain book

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EE44		3	0	0	3

SUBJECT TITLE: SHIPPING AND OCEAN FREIGHT LOGISTICS MANAGEMENT

OBJECTIVE:

The objective of this module is to provide the students with a good knowledge of ocean freight operations, services and management that can support them in various business functions and roles such as operations, customer service, account management and sales.

COURSE OUTCOME

Analyse issues in International sourcing and trade and take a strategic view of the global business environment impacting International supply chains Apply analytical techniques to arrive at cost effective solutions to meet SC requirements of efficiency and responsiveness. Decide optimal financing options for International trade Manage International Logistics & Supply chain partners and service providers Deploy knowledge of regional and international trading blocs in solving problems of International logistics

Unit I Shipping industry and business - description of a ship. Uses of a ship or a floating vessel. Classification of ship (route point) (cargo carried) - superstructure - tonnages & cubics - drafts & load lines - flag registration - Different types of cargo. (packaging, utility or value). Trimming - Cleansing - Unitized cargo.

Unit II Stevedoring, Lighterage Services and Security - Port trusts - operational unit - services - Seaports - Vessel Operations - pilotage - Stevedoring - Dock Labour Boards - charges - Automated Container Handling - security at ports and harbors. Role of security agencies - lighterage services.

Unit III Shipping Lines - Hub & Spoke - Process flow - Advices - Booking - Containerization - Containers - Container numbering - Process flow - Shipping Sales - Leads - Quotations - Customer Service.

Unit IV Operations - Volume / Weight calculations - Shipment Planning basics - Preparing & loading containers - Types of container services - FCL - Consolidation - LCL - Advanced Scientific shipment planning - Container de-stuffing.

EMPLOYABILITY

Unit V Documentation - Bill of Lading basics - MBL - HBL - CY - CFS - Advanced learning in Bills of Lading - Sea Way bill - Combined transport - MTO - Multimodal Transport Document (MTD) - Invoicing - Release of cargo - Cross Trade & Documentation - Conditions of Contract - Managing Key Accounts - Trade Lane Development - Consortium.

SUGGESTED READINGS:

1. Carriage of goods by sea / John F. Wilson (Harlow: Longman).
2. Containerization / (by) J.R. Whittaker (Hemisphere; Wiley)
3. The economics of tramp shipping / (by) B.N. Metaxas. (Athlone Press)
4. Shipping and Logistics Management by Yuen Ha Lun, Kee Hung Lai, Tai Chiu Edwin Cheng (Springer)
5. Getting the Goods: Ports, Labor, and the Logistics Revolution by Edna Bonacich and Jake B. Wilson (Cornell University Press)
6. Ocean Freights and Chartering by Cyril Frederick Hardy Cufley (Adlard Coles Nautical)
7. Logistics and Distribution Management by Alan Rushton, Phil Croucher & Peter Baker (CILT)

INTERNATIONALBUSINESS

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF33		3	0	0	3

SUBJECT TITLE: INTERNATIONAL MARKETING

Objectives: To understand the principles & concepts in Marketing, to provide the knowledge of marketing management in the international perspective to develop marketing strategies for the dynamic international markets.

COURSE OUTCOME

- Demonstrate interactive communications skills
- Demonstrate use of information technology
- Obtain an understanding of the globalization context for business
- Apply critical thinking skills to complex business problems
- Be able to use analytic skills in addressing business problems

Unit 1: International Marketing: Scope and Significance of International Marketing, the strategic importance of international marketing, Differences between international and domestic marketing. Need for international trade, trends in foreign trade. International market environment - Business Customs in International Market.

Unit 2: Canalising and targeting international market opportunities: regional market Characteristics, Marketing in transitional economies and third world countries, international market segmentation and targeting. International Market Entry Strategies: Indirect Exporting, Domestic Purchasing, Direct Exporting, Foreign Manufacturing Strategies Without Direct Investment, Foreign Manufacturing Strategies With Direct Investment. Entry Strategies of Indian Firms.

Unit 3: International product management: International product positioning, Product saturation Levels in global Market, International product life cycle, Geographic Expansion Strategic Alternatives. New products in International Marketing, Product and culture, brands in International Market.

EMPLOYABILITY

Unit 4: International Marketing Channels: channels Distribution Structures, Distribution Patterns, Factors effecting Choice of Channels, the Challenges in Managing An international Distribution Strategy Selecting Foreign Country Market intermediaries. The management of physical distribution of goods.

Unit 5: Pricing and Promotion for international Markets: Environmental influences on Pricing Decisions, Grey Market goods, Transfer pricing, Global Pricing Policy Alternatives. Global Advertising and branding, selecting an advertising agency. Personal selling, Sales Promotion, Public Relations and Publicity, Sponsorship Promotion. Export Policy Decisions of a firm, EXIM policy of India. Export costing and pricing, Export procedures and export documentation. Export assistance and incentives in India.

Text Books

1. Philip Kotler, (2010), *Marketing Management - The South Asian Perspective*, Pearson
2. Warren J. Keegan (2010): *Global Marketing Management* Pearson Education

Reference Books:

- 1) Svend Hollensen (2010): *Global Marketing: A Decision-Oriented Approach - 3rd Edition*, Pearson Education.
- 2) Ramasamy, Namakumari (2010) *Marketing Management*, McMillan Publishers

3) **Saxena: Marketing Management (Tata McGraw-Hill)**

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EF34			3	0	0	3

SUBJECTTITLE: INTERNATIONALHUMANRESOURCEMANAGEMENT

Objectives:ToprovideinsightfromInternationalHumanResource Management(IHRM)togive anoverview andthepracticalimplicationsofoperatingacrossnationalbordersinthepursuitofcorestrategiccompetences,the

COURSE OUTCOME
 Human Resource Management (HRM) is to give students the knowledge, understanding and key skills that are required by today's HR professionals and to enable students to effectively contribute to dynamic organisations.

management of global organizational values and culture, and the competition for talent.

Unit-1: Introduction and Overview-Global Market Context-Key Perspective in Global Workforce Management-Cultural Foundations of International Human resource Management- Understanding culture-Major models of National Culture-final Caveats on Culture and Global Workforce Management- Changes and challenges in the Global Labor Market-Globalization-Technological Advancement- change in labour force Demographics and Migration-Emerging on the contingent workforce- Offshoring- global workforce Management challenges.

Unit-2: The key role on International HRM in Successful MNC Strategy-Knowledge Transfer-Global Leadership training and Development-Strategic Control Needs-Competitive strategy of Multinational corporations-Structuring for Optimal global Performances-Linking Human Resource management practices to Competitive Strategy and Organization Structure- Paradigm Shift of international Human Resource Management from contingency model to Process Development.

Unit-3: Global Human Resource Planning From strategy to Decision about work Demand and labour supply External Environment Scanning- Job Design for Meeting global Strategy work demand HR planning for the Long term-Global Staffing: General Actors Affecting Global Staffing-Global Recruitment of Human Resources-Global selection of Human Resources.

Unit-4: Global workforce Training and Development : Strategic role of Training and Development in the global Market Place- Fundamental concepts and principles for Guiding global Training and Development- Training imperative for the global workforce- Managing International Assignments- Expatriate Preparation, Foreign Assignment and Repatriation-International Assignments considerations for Special Expatriates-New and Flexible International Assignments.

EMPLOYABILITY

Unit-5: Global workforce performance Management: Performing Management Process- Important consideration for Global Performance Management-Planning and Implementing Global Performance Appraisal- Compensation for a Global workforce-Managing Compensation on a global Scale-Fundamental Practices-Key compensation for Expatriates, HCN s and TNC s Global Employee Relations- current ER issues-Influence of MNC s and Union on Global ER.

References:

1. Charles M Vance and Yongsun Paik, Managing Global workforce, PHI, 2009.
2. Mark E. Mendenhall, Gary R. Oddou, Gunter K. Stahl, Reading and Cases in International
3. Human Resource Management, Routledge, Fourth Edition, 2007.
4. Tony Edwards and Chris Rees: International Human Resource Management, Pearson, 2009.
1. Bhatia S.K. 2005. *International Human Resource Management: A Global Perspective: Practices and Strategies for Competitive Success*, Deep and Deep Book Publishers, New Delhi,
2. Dessler, G. 2005. *Human Resource Management* (10th Ed.), Prentice Hall Publishing Company Limited,

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	20260EF35			3	0	0	3

SUBJECT TITLE: CROSSCULTURALMANAGEMENT

Objectives: To provide a thorough understanding of the impact of an international context on management practices based on culture. To explain and evaluate frameworks for guiding cultural and managerial practice in international business.

COURSE OUTCOME

- Develop an in-depth understanding of the nature of societal culture and its multiple dimensions, and enhance their ability to analyze the influence of culture on behaviour, particularly with respect to management;
- Enhance their situational awareness and critical thinking through exposure to many examples of cross-cultural interaction in different cultures, organizations, and management situations;
- Increase their behavioral effectiveness in interactions with people from other cultures;

Unit-1: Introduction Determinants of Culture Facets of culture Level of Culture National Cultural dimensions in the business context The influence of National Culture on business culture. Business Cultures: East and West.

Unit-2: Cultural Dimensions and Dilemmas: Value orientations and Dimensions Reconciling cultural dilemmas Culture and Styles of Management: Management tasks and cultural values.

Unit-3: Culture and Organizations: Culture and corporate structures Culture and Leadership Culture and Strategy Cultural change in Organizations - Culture and marketing Cultural Diversity.

Unit- 4: Culture and Communications: Business communication across cultures Barriers to intercultural communication Negotiating Internationally.

Unit-5: Cross Cultural Team Management: Working with International teams Groups processes during international encounters Conflicts and cultural difference Understanding and dealing with conflicts Developing Intercultural relationships.

EMPLOYABILITY

References

Marie-joelle Browaeys and Roger Price: Understanding Cross-Cultural Management, Pearson, 2010. David C. Thomas: Cross Cultural Management, 2/e, Sage Publications, 2008. Nigel Holdon, Cross Cultural Management: Knowledge Management Perspective, Pentice Hall, 2001. Parissa Haghirian: Multinational and Cross Cultural Management, Routledge, 2010. Richard Mead: International Management - Cross cultural Dimension, 3/e, Blackwell, 2005.

Text Books

1. Helen Deresky, *International Management: Managing across Borders and Cultures*, 5th Edition, Pearson Education, 2009
2. Richard M. Hodgetts & Fred Luthans, (2005), *International Management*, 3rd Edition, Tata McGraw Hill Publications, New Delhi,

Reference Books:

1. Hodgetts, R., M., & Luthans F, (2005), *International Management*, Tata McGraw Hill Publications, New Delhi.
- Hill, C. (2007) *International Business: Competing in the Global Marketplace*. (6th ed) Tata McGraw-Hill.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF36		3	0	0	3

SUBJECT TITLE: GLOBAL LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Objective: The course provides the analytical framework for understanding the logistic models and supply chain techniques in an international perspective.

COURSE OUTCOME

Analyse issues in International sourcing and trade and take a strategic view of the global business environment impacting International supply chains. Apply analytical techniques to arrive at cost effective solutions to meet SC requirements of efficiency and responsiveness. Decide optimal financing options for International trade Manage International Logistics & Supply chain partners and service providers Deploy knowledge of regional and international trading blocs in solving problems of International logistics

UNIT I Logistics Management: Concepts – Importance – Elements of the logistic System – Marketing and logistic mix – Logistics and marketing interface – Value-chain and production efficiency.

UNIT II Shipping Industry: Types of ships – Shipping systems: linear, Tramp, conference, chartering, Baltic freight exchange – Shipping intermediaries: agent, forwarder, brokers and others – containerization – types of containers – ICDs – CFS – CONCOR.

UNIT III Air Transport: Air transport – Air freight – IATA – Cargo handling – Designing the International Information system – system modules – Distribution and Transportation.

UNIT IV Supply chain: Definition – scope and importance of supply chain – supply chain drivers and metrics - efficient and responsive supply chain - Designing supply chain network: Distribution network – Factor influencing distribution - Transportation decision in supply chain management

UNIT V Forecasting and planning in supply chain management – Pricing in supply chain management - Role of IT in supply chain management - co-ordination in supply chain management.

EMPLOYABILITY

Text Books

1. Chopra and Meindl “Supply chain management: Strategy, planning and operations”

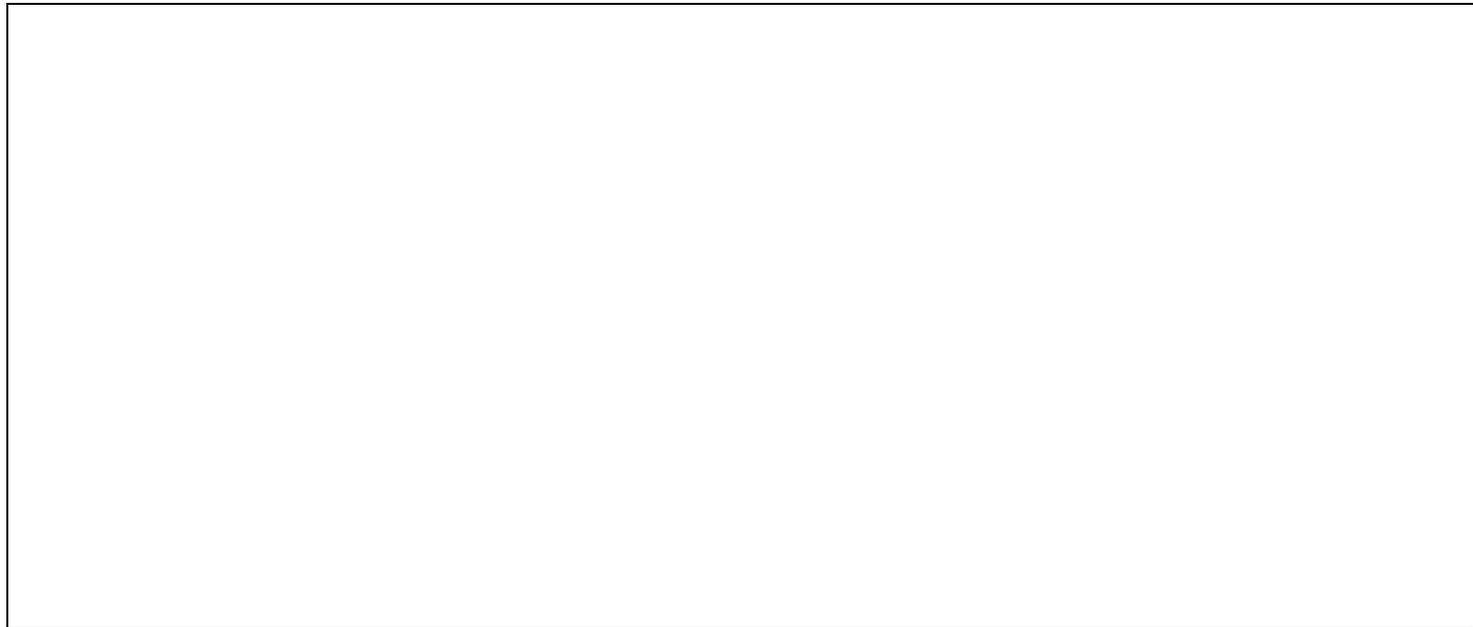
David P, “International Logistics” Biztantra, New Delhi, 2006.

Reference Books:

1. Donald J Bowersox and David J Class “Logistics Management, Tata Mc. Graw Hill, New Delhi.

2. David Stewart, “International Supply chain Management”, Cengage publications, 2008.

3. Reji Ismail, “Logistics Management” Excel Books, 2008.



SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF37		3	0	0	3

SUBJECT TITLE: INTERNATIONAL TRADE PROCEDURES AND DOCUMENTATION

Objectives: It gives an understanding on the India's trade position in the world and the various trade procedures involved in an international business. It gives an insight to the various documents required for trading.

COURSE OUTCOME

Explain the concepts in trade documentation in international business with respect to foreign trade Apply the current business phenomenon and to evaluate the global business environment in terms of economic, social and legal aspects Analyse the principle of international business and strategies adopted by firms to expand globally Integrate concept in international business concepts with functioning of global trade

UNIT I International Trade: Need and importance of International Trade – Recent Trends in World Trade – Leading players – India's Foreign Trade – Commodity composition and Destination – India's position in World merchandise trade and services – India's Foreign Trade Policy.

UNIT II Export Procedure: Starting an export firm – Selection of an export product – Market selection – Buyer selection - Registration procedure with Sales Tax, Central Excise and various Boards and councils – Exim code number – Elements of export contract – Incoterms – Terms of payment and Letter of Credit.

UNIT III Export Documentation: Types of documents – Transport, Negotiation and Insurance documents.

UNIT IV Export Finance: Sources of Finance - Role of commercial bank, EXIM Bank, ECGC and others – Export promotion Schemes – Insurance for Export – Types – export credit insurance – Risk Management – Types of risks – mitigation methods.

UNIT V Import Procedure and Documentation: Global sourcing – Types of global procurement – Tender – Negotiation – Contract and others – Customs regulations and import clearance formalities – Types of import licenses - Export Promotion Capital Goods Scheme (EPCG) license - Duty exemption scheme – Duty Entitlement Pass Book Scheme (DEPBS) - Import formalities for 100% EOUs and SEZs - Import Risk Management..

EMPLOYABILITY

Text Books

1. Aseem Kumar "Export and Import Management", Excel Books, 2007
2. David Stewart, "International Supply Chain Management", Cengage publications, 2008

Reference Books:

1. Jeevanandam C "Foreign Exchange: Practices Concepts and control" Sultanchand Publications, 2002.
2. Foreign Trade Policy: Handbook of Export Procedure and Annual of the Ministry of Commerce, Government of India.
3. Export and Import Manual, Nabhi Publications, New Delhi.
4. World Development Indicator, World Bank Publication

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF38		3	0	0	3

SUBJECT TITLE: INTERNATIONAL STRATEGIC MANAGEMENT

Objectives: The objective of the course is to familiarize the participants with the concepts, tools and techniques of international strategic management so as to enable them develop analytical and conceptual skills and the ability to look at the totality of situations.

COURSE OUTCOME

Understand the basic concepts and principles of strategic management analyse the internal and external environment of business • Develop and prepare organizational strategies that will be effective for the current business environment • Devise strategic approaches to managing a business successfully in a global context

UNIT I Concept, Characteristics and Dimensions of Strategic Management – Emergence of International Strategic Management (ISM) – Logic and process of Internationalization – Forces necessitating the adoption of ISM concept by MNC's as well as Indian Companies – Corporate global strategy

UNIT II Nature, components and significance of environmental scanning – Corporate capability analysis – Diagnosing industry globalization potential – Building global market participation – Competition in global industries

UNIT III Core competencies – Significance of core competence concept in strategy making – Value Chain Analysis – Significance of value chain analysis in strategy making – Balanced Scorecard to link today's action with tomorrow's goals

EMPLOYABILITY

UNIT IV Setting corporate objectives in MNC's – External and internal forces interacting with corporate objectives – Identifying strategic alternatives – Stability strategy – Growth and diversification strategy – Merger, acquisitions and retrenchment

UNIT V Choice of corporate strategy : CIT, CASCADE and PORTFOLIO MODELS – Formulating generic competitive strategy – Implementing corporate strategy – Strategic control and operational control

Text Books

1. John A. Pearce & Richard B. Robinson. Strategic Management AITBS Publication.

Reference Books:

1. Azhar Kazmi, Business Policy, Tata McGraw-Hill Publishing Co Ltd, New Delhi.
2. Srivastava, Management Policy and Strategic Management, Himalaya Publishing Co.
3. Porter, M., Competitive Strategy Techniques for Analyzing Industries and Competitors, The Free Press, New York.
4. Thompson and Strickland, Strategic Management – Concepts and Cases, Tata McGraw Hill, New Delhi.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF39		3	0	0	3

SUBJECT TITLE: GLOBAL BUSINESS ETHICS & CORPORATE GOVERNANCE

Objectives: The course is to sensitize the students to issues pertaining to sustainable development and business ethics and enable development and business ethics and enable them to understand the implications of various statutory and policy guidelines concerning corporate governance for actual business decision making.

COURSE OUTCOME

Comprehend the relationship between ethics, morals and values in the workplace.
Analyze and understand various ethical philosophies to explain how they contribute to current management practices. Critically apply understanding of ethics of real-world contexts and gather and analyse information by way of undertaking a research project on a topic relevant to business ethics.

UNIT I Business Ethics – trans-cultural Human Values in Management Education – Relevance of Values in Management – Need for values in Global Change – Indian Perspective – Values for Global managers

UNIT II Ethical Dilemma – Ethical decision making – Ethical Reasoning – Benefits of managing ethics in work place – Organization Ethics Development System - Organizational Culture – Ethics Tools – Code of ethics – Guidelines for developing code of ethics – Value based leadership

UNIT III Work ethics – work culture – Ethical theories – Ethical Values – Environmental ethics – Environmental Management – Environmental Management System – Environmental Laws – Consumer Protection

UNIT IV Corporate Governance – Meaning – Code of Corporate Governance – Audit Committee – Corporate Excellence – Role of Independent Directors – protection of Stakeholders – Corporate Social Responsibility – Changing Role of Corporate Boards with changing times – Corporate Governance for Market Capitalism

EMPLOYABILITY

UNIT V Indian Ethos in Management – Principles – Approaches – Role of Gita – Karma Yoga – Wisdom Management – Quality of Work Life – Strategies for Work Life Balance

Text Books

1. John R Boatright, (2007), Ethics and the conduct of Business - Dorling Kindersley (India) Pvt Ltd New Delhi for Pearson Education, Third Impression

Reference Books:

1. Chakraborty, S, K., Management by Values, Oxford University press
2. Balasubramanian, R., Corporate Governance, IIM Bangalore
3. Laura P. Hartman, Perspectives in Business Ethics, Tata McGraw Hill
4. Bhatia, S. K., Business Ethics and Corporate Governance
5. Bowie Norman, Business Ethics, Prentice Hall
6. Laura P Hartman, *Perspectives in Business Ethics* - Tata McGraw Hill, New Delhi
7. OC Ferrell, John Paul Frederick, Linda Ferrell; *Business Ethics – Ethical Decision Making & Cases*, - Biztantra, New Delhi.

COURSECODE	20260EF42	3	0	0	3
93					



SUBJECT TITLE: MANAGEMENT OF INTERNATIONAL DEVELOPMENT ORGANIZATIONS

Objectives: The course is to sensitize the students to issues pertaining to sustainable development and business ethics and enable development and business ethics and enable them to understand the implications of various statutory and policy guidelines concerning corporate governance for actual business decision making.

COURSE OUTCOME

Explain the role of incentives in political behaviour and economic performance. Discuss what stable institutional constellations comprise, how they come about, and under which conditions they perish. Map the links from incentive systems to micro and macro level economic performance. Compare and contrast why certain organisations are better suited to certain types of services and/or environments than others

Unit-1: International Development Organizations (IDO) Nature, Scope and Functions government/Non-government IDOs (UNESCO, UNIDO, DFID, UNAID, IMF, UNDP, DEEP) - IDOs & Specific Development Areas (Health, Education, HIV & AIDS, Disability, Rights and Empowerment, Women Empowerment, Child Rights, Environment, Energy conservation, etc.) - legal and Political factors.

Unit-2: Assistance and funding to IDOs: Prerequisites, Regulations and Formalities to avail funding to IDOs - International aid flows ILO, UNESCO, UNDP, UNESCAP, UN-HABITAT, UNAID, USAID, DFID and other International NGOs.

Unit-3: Evaluation of Performance Based on parameters such as: Economic planning logical Framework - Financial and Economic Analysis - Process of Documentation - Social audit - Monitoring and Evaluation - Accountability - Estimation of Welfare, Poverty Inequality - Economic Growth - Ethical and Social issues

Unit-4: Cooperation and Collaborations: Role of Nations Policies - Role of International Government organizations, NGOs, INGOs, MNCs

EMPLOYABILITY

Unit-5: Functional Strategies: In specific issues pertaining to HR, Marketing Management and Finance - Case studies.

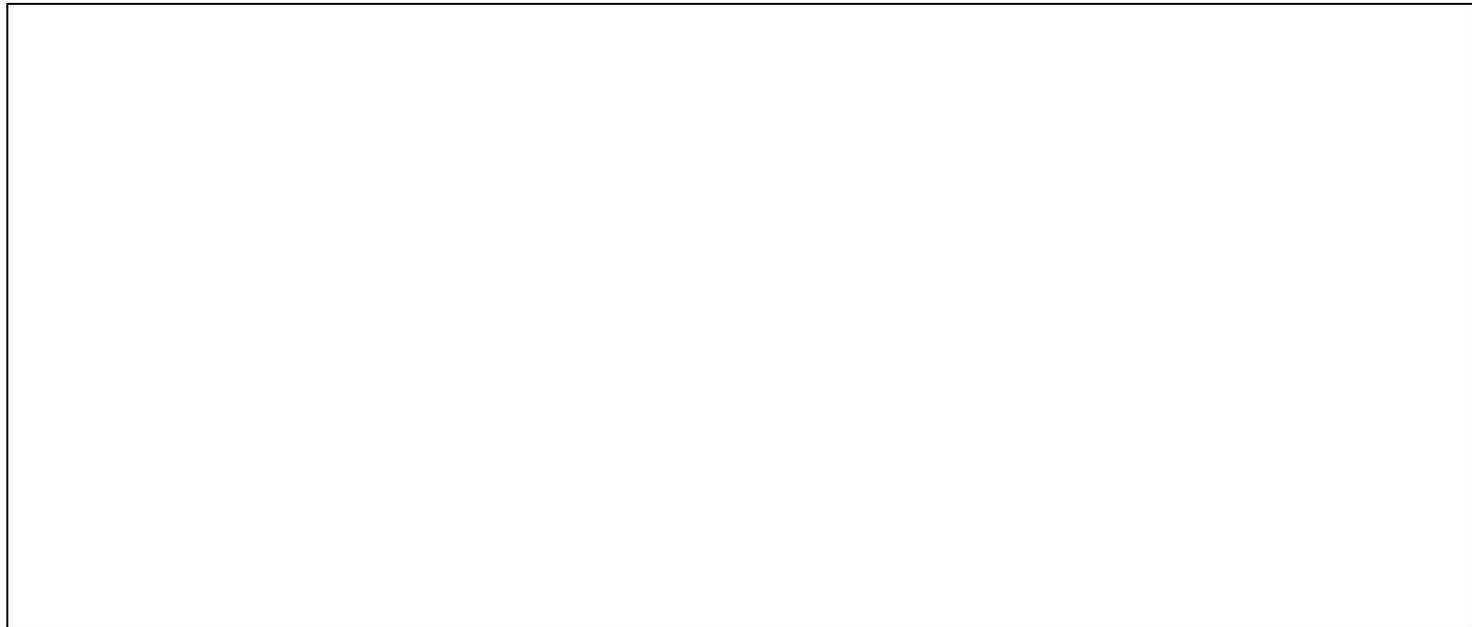
References:

IDOs Websites

Patton, Michael Quinn: Utilization- Focused Evaluation The New Century Text, 3rd Edition, Sage, 2008. Maggie Black: No Nonsense guide to International Development, New Internationalist, 2006.

Paul Hoy: Players and Issues in International Aid, Kumarian press, 1998.

David Lewis: The Management of Non-Government Development Organizations, Routledge, 2001.



SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EF43		3	0	0	3

SUBJECT TITLE: MERGERS AND ACQUISITIONS

Objectives: The course is to sensitize the students to issues pertaining to sustainable development and business ethics and enable development and business ethics and enable them to understand the implications of various statutory and policy guidelines concerning corporate governance for actual business decision making.

COURSE OUTCOME

Understanding of different types of mergers and acquisitions and the process involved in executing their deals. Develop an ability to understand factors influencing the valuation of a business and different methods used in Business Valuation.

Basic understanding about regulatory environment of mergers and acquisitions in India.

Unit-I: Introduction to Mergers and Acquisitions: Participants in Mergers and Acquisitions Common Motivations and Impact of Mergers and Acquisitions Challenges towards successful Mergers and Acquisitions. Take over Tactics: Alternative Takeover Tactics Alternative Takeover decision Prebid and Postbid.

Unit II: Regulatory Issues in Mergers: Federal Security Laws Insider Trading Laws Antitrust laws State Regulation effecting Mergers and Acquisitions Regulated industries Environmental Laws Labour and Benefit Law.

Unit III: Developing Business and Acquisition Plans: Planning Based Approach for Mergers and Acquisitions Building Business Plan Building Mergers and Acquisitions plan The Search and Screening Process Negotiations Implementing Post Closing Evaluation.

EMPLOYABILITY

Unit IV: Integration: Mergers, Acquisitions and Business Alliances: The Role of Integration in successful mergers and Acquisitions Integration as a process Integrating Business Alliances.

Unit V: Shared Growth and Shared Control Strategies: Motivations for Business Alliances Critical Success Factors for Business Alliances Strategic and Operational Plans Strategic and Operational Plans Business Alliances Deal Structuring. **Alternative Exit and Restructuring Strategies-** Motivators for Exiting Businesses Divestitures Spinoffs and Splitups - **Equity** Carveouts Voluntary Liquidations.

References:

Donald DePamphilis: Mergers, Acquisitions and other Restructuring Activities, 2/e, Academic Press, 2003. J. Fred Weston, Chung and Hoag: Mergers, Restructuring and Corporate Control, PHI, 2000. Kamal Ghosh Ray: Mergers and Acquisitions, PHI, 2010 Mark Chomas; Mergers and Acquisitions, Viva, 2009.

COURSECODE	20260EF44	3	0	0	3
95					

SUBJECT TITLE: INTERNATIONAL FINANCIAL MANAGEMENT

OBJECTIVE: To give the students an overall view of the international financial system – instruments and markets.

COURSE OUTCOME

Apply appropriate formats and technologies to financial communication. Analyse, apply and evaluate information within the global financial environment of foreign exchange to solve problems and make informed decisions.

Unit I

International Financial Management: An overview, Importance, nature and scope, International Business Methods, Recent changes and challenges in IFM - History of Global Monetary Systems - Evolution and practices in Foreign Exchange Markets - International Financial Institutions

Unit II

Fundamentals of Foreign Exchange – Parity theory and conditions – Factors affecting determination of Exchange rate – Various exchange rate types.

Unit III

Exposure and Risk Management - hedging – speculation – arbitrage - internal and external techniques of hedging – derivatives – meaning – significance – types.

Unit IV

Regulatory Framework for International Finance - Short term financial management in a global set-up – treasury functions – International Taxation – Double Taxation Avoidance Agreement

EMPLOYABILITY

Unit V

Global capital Markets: Issues, investors, intermediaries. Disintermediation, Deregulation, Securitization, Globalization. Various methods of raising resources by borrowers in International markets. Types of Bonds, Floating Rate Notes (FRNs), Deep Discount Bonds, Zero Coupon Bonds, Dual Currency Bonds, Equity related Bonds. Procedure for Bonds Issues.

SUGGESTED READINGS:

1. Shapiro, Alan.C.: Multinational Financial Management, Prentice Hall, New Delhi
2. Apte, P.G.: International Financial Management, Tata McGraw Hill, New Delhi
3. Buckley, Adrian: Multinational Finance, Prentice Hall, New Delhi
4. Eitman, D.K. and A.I. Stenehill: Multinational Business Cash Finance, Addison Wesley, New York
5. Henning, C.N., W.P. Gogot and W.H. Scott: International Financial Management, McGraw Hill, International Edition.
6. Levi, Maurice D.: International Finance, McGraw Hill, International Edition
7. Rodrigues, R.M. and E.E. Carter: International Financial Management, Prentice Hall, International Edition
8. Yadav, Surendra S, P. K. Jain and Max Peyrard: Foreign Exchange Markets, MacMillan, New Delhi
9. Zeff, D. and J. Zwick: International Financial Management, Prentice Hall, International Edition.
10. Sharan: International Financial Management, PHI, New Delhi

SYSTEMS

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EG33			3	0	0	3
SUBJECTTITLE: SOFTWAREENGINEERING							
OBJECTIVE: Thiscourseaimstounderstandthesoftwareengineeringandapplytheknowledgeofadisciplinedapproach tothedevelopmentofsoftwareandtothemanagementofthesoftwareproductlifecycle.							
COURSE OUTCOME							
<ul style="list-style-type: none"> • How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment • An ability to work in one or more significant application domains • Work as an individual and as part of a multidisciplinary team to develop and deliver quality software 							
Unit–I OVERVIEW OFSOFTWAREENGINEERING Softwareengineeringasdiscipline,Softwareprocesses,Softwareprojects,Requirementsengineeringprocesses,Systemmodels,Software prototyping,andFormalspecification.							
Unit–II SOFTWAREDEVELOPMENTMODELS Software Life Cycle, Waterfall model, Spiral model, Incremental Development, Evolutionary Development,Re-use orientedDevelopment.							
Unit–III SOFTWAREDESIGN Architectural design, Distributed Systems architecture, OO design, Real-time software design, Design withreuse, User Interface design. Software Metrics: software process and project metrics, technical metrics forsoftware.							
Unit–IV SOFTWAREQUALITY VerificationandValidation, Softwaretesting, Criticalsystemsvalidation, CMMandPCMMconcepts.							
EMPLOYABILITY							
Unit–V SOFTWAREMANAGEMENT Managingpeople,Softwarecostconstruction,QualityManagement,Processempowerment.LegacySystems,Software change,Softwarere-engineering,ConfigurationManagement.							
SUGGESTEDREADINGS:							
<ol style="list-style-type: none"> 1. Roger S.Pressman:SoftwareEngineering–A Practitioner’sApproach–Tata McGrawHill –IVedition. 2. Sommerville,Ian:SoftwareEngineering,AddisonWesley. 3. S.A.Kelkar,SoftwareProjectManagement,PHI 4. CarloGhezzi, MehdiJazayeri, DinoMandrioli–FundamentalsofSoftwareEngineering–PHI. 							

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EG34			3	0	0	3

SUBJECTTITLE:SOFTWAREPROJECTMANAGEMENT

OBJECTIVE:

This course gives an overview of software project management and the project planning. It also covers the Step Wise framework in project planning. It also imparts knowledge to the students on how to evaluate and assess the projects and to find the cost of the project using cost benefit evaluation techniques.

Unit I SYSTEM ANALYSIS & DESIGN

Overview of system analysis & Design : Introduction to different methodologies & Structured system analysis – Details of SDLC approach – E.R. diagrams – DFD concepts – Data dictionary concepts. Structure charts – modular programming – I/O & file design consideration.

Unit II SYSTEM IMPLEMENTATION

System implementation & maintenance: Implementation Strategies – SW / HW selection & procurement – Control & security – issues of designing & implementing on-line systems – data communication requirements – selection issues

Unit III PROJECT DEVELOPMENT & DATABASE DESIGN

Introduction to Database technologies & CASE tools with specific packages – overview of relational model – Database creation – SQL command – Normalization – designing forms & reports – using CASE tools for system analysis & design – case studies – Cost / benefit analysis – project & resource planning – design & development testing & documentation.

Unit IV SOFTWARE PROJECT MANAGEMENT

Software project management: challenges & opportunities – changing technologies & approaches – choice of development of methodologies & technical platforms, project management techniques – monitoring & measurement of progress.

EMPLOYABILITY

Unit V SOFTWARE PROJECT MANAGEMENT

Software project management – elements, cost estimation, manpower planning, Software & Product Metrics – Quality assurance & control – standards & documentation – testing – implementation – training – technology management – quality standards – certificate – handling multiple projects, issues of shared development.

SUGGESTED READINGS:

1. Software Engineering Principles and practice by Waman S. Jawadekar Tata Mcgraw Hill Co. – Chennai.
2. Walker Royce, 'Software Project Management' - A unified Framework, Pearson Education Asia, New Delhi 2000.
3. Software Project Management by S.A. Kelkar, PHI learning India PVT Ltd.,
4. Software project management (2 volumes set) by Prof. S.N. Singh and S.L. Gupta – Global India publications PVT Ltd., New Delhi.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EG35			3	0	0	3

SUBJECT TITLE: RELATIONAL DATABASE MANAGEMENT SYSTEMS

OBJECTIVE:

This course helps the student to understand the roles and technology of databases for the Internet and Worldwide Web. This also helps to understand the roles of database administration in the enterprise and be able to perform common database administration functions.

COURSE OUTCOME

Identify the different project contexts and suggest an appropriate management strategy. Practice the role of professional ethics in successful software development. Identify and describe the key phases of project management. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

UNIT–I Introduction

Basic concepts of Database – purpose of database - characteristics of database; roles of database manager, database administrator and database users. Database systems, concepts and architecture. Distributed databases-structure and design.

UNIT– II Data Models

Data models, schema and instances. E-R models – E-R diagram. Hierarchical model, relational model, object oriented model, object relational model – comparison of models.

UNIT–III Database system and query languages

Relational model, Languages and system, structure of relational database, modifying the database. Relational commercial language–SQL. Relational database management system ORACLE/DB2.

UNIT-IV Relational Database design

Normalization process – First, second, Third, Fourth normal forms. Mapping relational data to files, data dictionary storage.

EMPLOYABILITY

UNIT–V Database Security

Database integrity, security, concurrency, recovery, client/server architecture.

SUGGESTED READINGS:

1. Leon.A, Database Management Systems, 'BPB publications', Delhi, 1997.
2. Date.C.J., An introduction to Database Systems, 7th edition, Pearson Education Asia.
3. Naveen Prakash, Introduction to Database Management, TMH, 1993.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EG36			3	0	0	3

SUBJECT TITLE: E-BUSINESS TECHNOLOGY AND MANAGEMENT

OBJECTIVE:

This course will help the students to recognize and understand ways of using digital technologies to improve intra and inter-organizational processes; and to analyze the impact that electronic commerce is having and will likely have on key sectors of the economy and assess the strategic implications this analysis holds for an organization.

COURSE OUTCOME

- understand the issues around defining ‘technology’, ‘innovation’ and ‘innovation management’
- recognise the diversity of types of innovation, innovators and innovation settings
- understand the nature and extent of technological change and innovation
- critically assess and explain key current issues in our understanding of innovation as a field of study.

UNIT-I

Introduction to E-Business: Overview of E-Business; Information Services; Interpersonal Communication; Shopping Services; Virtual Enterprises. E-Commerce: Origin and Need of E-Commerce; Factors affecting E-Commerce; Business dimension and technological dimension of E-Commerce; Internet as an E-Commerce enabler handling business transactions.

UNIT- II

E-commerce business models. Consumer oriented e-commerce –etailing and models - Marketing on web – advertising, e-mail marketing, e-CRM; Business oriented e-commerce – E-Government, SCM; Web Auctions, Virtual communities and Web portals. Mobile Commerce.

UNIT-III

EDI: EDI application in business development; EDI technology; EDI as a re-engineering tool; Financial EDI. E-Commerce and retailing: On-line retail industry dynamics; On-line mercantile models from customer perspective; Management challenges in on-line retailing

SKILL DEVELOPMENT

UNIT-IV

Handling payments: Electronic Fund Transfer System, Digital Token and notational based electronic payment system, smart card, credit card and emerging financial instruments. E payments - Characteristics of payment of systems, protocols, E-cash, E-check and Micro payment systems. E-Commerce and Banking: changing dynamics in banking industry; Management Issues in online banking.

UNIT-V

Indian Perspective: Benefits of E-Commerce; Drawbacks and limitations of E-Commerce; Major requirements in E-Business; Emerging trends and technologies in E-Business; From E-Commerce to E-Business; Web security: Introduction; Firewalls and transaction security.

SUGGESTED READINGS:

1. Henry Chan & el, E-Commerce – fundamentals and Applications, Wiley India Pvt Ltd, 2007.
2. Gary P. Schneider, Electronic commerce, Thomson course technology, Fourth annual edition, 2007.
3. Bharat Bhasker, Electronic Commerce – Frame work technologies and Applications, 3rd Edition. Tata McGraw Hill Publications, 2008.
4. Krishnamurthy-E-Commerce Management: Text and Cases (Vikas)

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EG37			3	0	0	3

SUBJECT TITLE: DATA WAREHOUSING AND DATA MINING

OBJECTIVE:

This course helps the students to understand the overall architecture of a data warehouse and techniques and methods for data gathering and data pre-processing tools. The different data mining models and techniques will be discussed in this course. Data mining and data warehousing applications will also be explored.

COURSE OUTCOME

Analyzing Dimensionality. Reduction. Feature Subset Selection. Understanding. Discretization and. Analyzing Similarity – Basics and Dissimilarity. Understanding. Association Rules.

Understanding APRIORI. principal, support and.

UNIT-I

Data – Types of Data - Data warehousing concepts– difference between operational system and data warehouse system-Application of data warehouse–Benefit of data warehousing systems-Metadata.

UNIT-II

Data warehousing methodology - Data warehousing process - Data warehouse architecture - Designing data warehouse.

UNIT-III

Data mining concepts – Integration of a Data Mining System with a Data Warehouse - Benefits of data mining systems - Data Mining Functionalities - Interestingness of patterns - Classification of Data Mining Systems.

UNIT-IV

Data mining process - Data mining techniques – Data mining tools - Data mining applications - Issues in data mining.

UNIT-V

Web Data Mining – Association Rule Mining

SKILL DEVELOPMENT

SUGGESTED READINGS:

1. G.K. Gupta, Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall India, 2006.
2. McLaren & McLaren: Data Warehousing and Data Mining, Tata McGraw-Hill, New Delhi, 2003.
3. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw-Hill Edition, Tenth Reprint 2007.
4. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, 2007.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EG38		3	0	0	3
SUBJECT TITLE: KNOWLEDGE MANAGEMENT							
<p>OBJECTIVE: The goal of the course is to prepare students to become familiar with the current theories, practices, tools and techniques in knowledge management (KM), and to assist students in pursuing a career in the information sector for profit and not-for-profit organizations. In addition, students will learn to determine the infrastructure requirements to manage the intellectual capital in organizations.</p>							
<p>COURSE OUTCOME Use a framework and a clear language for knowledge management concepts; • Describe how valuable individual, group and organizational knowledge is managed throughout the knowledge management cycle; • Define the different knowledge types and explain how they are addressed by knowledge management; • Describe the major roles and responsibilities in knowledge management implementations;</p>							
<p>Unit-I: The Knowledge Economy: Data–Information–Knowledge, Attributes of Knowledge as an Economic Resource – Knowledge Capital Vs Physical Capital - Types of Knowledge - Scope of Knowledge Management–Building Knowledge Societies.</p>							
<p>Unit-II: Knowledge Management and Information Technology: Role of Information Technology in Knowledge Management Systems, Knowledge Management Tools and Knowledge Portals – Knowledge Organization & Managing Knowledge Workers</p>							
<p>Unit-III: The Knowledge Process: Knowledge Management Systems Life Cycle - Stages of KM Process, Knowledge Creation & Knowledge Architecture–Knowledge Capturing Techniques– Knowledge Codification–Transferring and Sharing Knowledge.</p>							
<p>Unit-IV: Implementation of Knowledge Management: Business Intelligence and Internet Platforms, KM & the Indian experience, Net Banking in India– Role of Knowledge Management in Organizational Restructuring–The Mystique of a Learning Organization - Management of Intellectual Property.</p>							
<p>SKILL DEVELOPMENT</p>							
<p>Unit-V: Future of Knowledge Management and Industry Perspective: Knowledge Management in Manufacturing and service industry, Challenges and Future of Knowledge Management- Measures for meeting the Challenges of KM–Business Ethics and KM.</p>							
<p>SUGGESTED READINGS: Mattison: Web Warehousing & Knowledge Management, Tata McGraw-Hill, 2009 2. Becerra Fernandez: Knowledge Management: An Evolutionary View, PHI, 2009 3. Fernando: Knowledge Management, Pearson, 2009 4. B. Rathan Reddy: Knowledge Management, Himalaya, 2009 5. Madan Mohan Rao, Leading with Knowledge, Tata Mc-Graw Hill, 2011.</p>							

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EG39		3	0	0	3
SUBJECT TITLE: ENTERPRISE RESOURCE PLANNING							
OBJECTIVE: To understand about ERP systems, ERP software and modules, Implementation of ERP, and Emerging trends on ERP.							
OUTCOMES 1. Make basic use of Enterprise software, and its role in integrating business functions 2. Analyze the strategic options for ERP identification and adoption. 3. Design the ERP implementation strategies. 4. Create reengineered business processes for successful ERP implementation							
UNIT-I: Introduction Overview of Enterprise Systems – Evolution – Risks and Benefits – Fundamental Technology – Issues to be considered in Planning Design and Implementation of Cross Functional Integrated ERP Systems.							
UNIT-II: ERP Solutions and Functional Modules Overview of ERP Softwares – SAP – Baan – IFS – Oracle – People Soft – Comparison of ERP software, Overview of ERP Modules – Sales and Marketing, Accounting and Finance, Materials and Production Management. Business Process Reengineering concepts.							
UNIT-III: ERP Implementation Planning Evaluation and selection of ERP Systems – Implementation Life Cycle – ERP implementation, Methodology and Frame Work – Training – Data Migration. People Organization in Implementation – Consultants, Vendors and Employees.							
UNIT-IV: Post Implementation Maintenance of ERP – Organizational and Industrial Impact; Success and Failure factors of and ERP Implementation. Measuring ERP Benefits – Balanced Score Card Method – ABCD Checklist.							
SKILL DEVELOPMENT							
UNIT- V: Emerging Trends on ERP Extended ERP Systems – CRM, SCM, Business Analytics – Future Trends in ERP Systems – Web Enabled, Wireless Technologies.							
SUGGESTED READINGS: 1. Alexis Leon, ERP Demystified, second Edition Tata McGraw–Hill, 2006. 2. Jagan Nathan Vaman, ERP in Practice, Tata McGraw–Hill, 2008 3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2006. 4. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP – Concepts and Practice, Prentice Hall of India, 2006. 5. Mary Sumner, Enterprise Resource Planning, 4 th edition, Pearson Education. 6. K. Balasubramanian, S. Ushapriya & K. Hema, Enterprise Resource Planning: Emerging concepts & cases							

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EG42		3	0	0	3
SUBJECTTITLE:INFORMATIONSTORAGEANDMANAGEMENT							
<p>OBJECTIVE: Thiscoursehelps tolearnandunderstandthestoragemanagement,virtualizationtechnologies,infrastructureandstoragesecurity.</p> <p>OUTCOMES CO1: Design business continuity plan. CO2: Select a local replication technology to provide data backup. CO3: Distinguish different remote replication technologies. CO4: Discuss security issues and mitigate them. CO5: Select appropriate storage management software.</p> <p>UnitI Review data creation and the amount of data being created and understand the value of data to a business,challenges in data storage and data management, Solutions available for data storage, Core elements of a datacenter infrastructure, role of each element in supporting business activitiesIntelligent Storage system –IntroductiontoFlashDrives.</p> <p>UnitII Hardwareandsoftwarecomponentsofthehostenvironment,Physicalandlogicalcomponentsofaconnectivity environment, Major physical components of a disk drive and their function, logical constructs ofa physical disk, access characteristics - Concept of RAID and its components - Storage Area Networks –Attached Storage: Benefits, components – NAS Protocol & Implementation – File level Virtualization – ObjectbasedandUnifiedStorage:Devices andcomponents.</p> <p>Unit III List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiatebetween business continuity (BC) and disaster recovery (DR) - Backup and Recovery – Local Replication:Technologies–BackupinNASEnvironments–Dataduplication–Remotereplication.</p> <p>UnitV Information security, Critical security attributes for information systems, Storage security domains, List andanalyzes the common threats in each domain, Virtualization technologies – Security implementations inStorage Networking.</p> <p>SKILL DEVELOPMENT</p> <p>UnitV ManagingStorageinfrastructure-StorageinfrastructureManagementActivities&Challenges– IdealsolutionsforStorageInfrastructure management–Storagetiering.</p> <p>SUGGESTED READINGS:</p> <ol style="list-style-type: none"> 1. G.Somasundaram,AlokShrivastava,,"InformationStorageandManagement",EMCEducation Services,WileyPublishing,Inc,Edition2010. 2. RobertSpalding,,"StorageNetworks:TheCompleteReference",TataMcGrawHill,Osborne,2003. 3. MarcFarley,,"BuildingStorageNetworks",TataMcGrawHill,Osborne.2001. 4. MeetaGupta,StorageAreaNetworkFundamentals,PearsonEducationLimited, 2002. 							

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EG43		3	0	0	3

SUBJECTTITLE: CLOUDCOMPUTING

COURSEOBJECTIVE: To understand basics of cloud computing for business management

OUTCOMES

- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
- Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

UNIT I INTRODUCTION: Introduction to Cloud Computing, Evolution - Cloud Computing, Hardware, Internet and Software, Virtualization, Web Services on Cloud, Infrastructure-as-a-Service, Platform-as-a-Service, Software-as-a-Service, Building Cloud Network.

UNIT II IMPLEMENTATION AND CONTROL Privacy and its relation to Cloud-based Information Systems, Security in the Cloud, Common Standards in the Cloud, End-User Access to the Cloud Computing, legal and ethical dimensions.

UNIT III CLOUD COMPUTING FOR MANAGERS Centralizing Email Communications – Collaborating on Schedules, To-Do Lists, Contact Lists – online Community development – online collaboration tools for projects – Cloud Computing for business.

UNIT IV APPLICATIONS OF CLOUD SERVICES Applications – Online Planning and Task Management – Event Management – CRM- Cloud service development tools – word processing, databases, storing and file sharing on cloud.

SKILL DEVELOPMENT.

UNIT V VIRTUAL OFFICE MANAGEMENT Web-based communication tools – Web Mail Services – Web Conference Tools – Social Networks and Groupware – collaborating via blogs and Wikis; IBM, Amazon Ec2, Google Apps for Business, Salesforce.com, Ramco-On-Demand

TEXTBOOK

1. John W. Rittinghouse and James F. Ransome, “Cloud Computing Implementation, Management and Security”, 2010, CRC Press, Taylor & Francis Group, Boca Raton London New York.
2. Kumar Saurabh, Cloud Computing – Insights into new era infrastructure, Wiley India, 2nd Edition, 2012

REFERENCES

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, 2009
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
3. Alfredo Mendoza, “Utility Computing Technologies, Standards, and Strategies”, Artech House INC, 2007
4. Bunker and Darren Thomson, “Delivering Utility Computing”, 2006, John Wiley & Sons Ltd.
5. George Reese, “Cloud Application Architectures”, O’reilly Publications, 2009.

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EG44		3	0	0	3

SUBJECT TITLE: DECISION SUPPORT SYSTEM AND INTELLIGENT SYSTEMS

OBJECTIVE: To understand the components of DSS and IS. To know the appropriate model to be used for a problem

OUTCOMES

- Apply techniques of IDSS (e.g. artificial neural networks, machine learning, rule-based systems, etc.) and validate IDSS techniques to solve a complex industrial problem
- Identify decision factors, models, and analysis of intelligent decision support systems (IDSS) to support a smart production system.
- Appraise the frameworks of IDSS.
- Design a knowledge-based system for a smart production system.

UNIT I INTRODUCTION Management Support systems, Decision making, Models, DSS Overview, Data, Model, Knowledge Management system.

UNIT II DATA AND MODEL MANAGEMENT SYSTEMS Data Collection, Data Warehousing, Data Mining, Data visualization, Modeling, Static and dynamic, Optimization, Heuristic, Simulation, Multidimensional modeling.

UNIT III GSS, ENTERPRISE DSS, KMS Group support system, Technologies, Enterprise DSS, Knowledge management methods, Technologies, Tools.

UNIT IV KNOWLEDGE BASED DSS Artificial Intelligence, Expert System, Knowledge Acquisition and validation, Knowledge representation, Inference techniques.

SKILL DEVELOPMENT

UNIT V ADVANCED INTELLIGENT SYSTEMS Neural Computing, Fuzzy Logic, Intelligent Agents, Implementation, Integration, Intelligent DSS.

TEXTBOOK

1. Efraim Turban and Jay E. Aronson, Decision Support System and Intelligent Systems, Prentice Hall International, 9th Edition 2010

REFERENCES

1. Janakiraman V. and Sarukesi K., Decision Support Systems, Prentice Hall of India, 6th Printing 2006
2. Lofti, Decision Support System and Management, McGraw Hill Inc, International Edition, New Delhi 1996.
3. Marakas, Decision Support System, Prentice Hall International, Paperback Edition, New Delhi, 2003

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HOSPITAL MANAGEMENT

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH33			3	0	0	3

SUBJECT TITLE: MANAGEMENT OF HOSPITAL SERVICES

OBJECTIVE:

To enable the students gain insights into various aspects like importance, functions, policies and procedures, equipping, controlling, co-ordination, communication, staffing, reporting and documentation of both the clinical and non clinical services in a hospital

OUTCOMES

CO1: Describe the health systems of various Countries including India

CO2: Discuss and learn public health care system in India

CO3: Develop, implement and manage various public health programs

CO4: Critically analyze the various components of health care delivery system in India

Unit- I Overview: Hospital operations management, role and decisions, Difference of hospital operations from other service and manufacturing organizations.

Unit – II Out Patient Services: Overview of the department, day care, accident and emergency services, physical medicine and rehabilitation, occupational therapy unit, physiotherapy department. **In Patient Services:** Ward design (general & specialized), critical care services – ICU, CCU, NICU, , medical services, surgical services – operation theater, nuclear medicine, burn unit, nursing services and administration.

Unit – III Specialty Services: Pediatrics, OBG & GYN, ENT, Ophthalmology, Orthopedic, Psychiatry, Anesthesia, Dental. **Super-specialty Services:** Cardiology, Thoracic Surgery, Neurology, Neurosurgery, Nephrology-Dialysis Unit, Transplantation Services

SKILL DEVELOPMENT

Unit–

IV Hospital Acquired Infection: Source and Control, Modern trends in Hospital Administration, Disaster Management, Information Systems, Telemedicine.

Unit–V Disaster Management Services: Basics of disaster management and Mass casualties Components of disaster plan : pre-hospital and hospital, Disaster alertness in Hospital Disaster management planning and implementation, Severity of illness amongst disaster victims and risk assessment- **Disaster preparedness-** Policies & procedures for general safety, fire safety procedure for evacuation, disaster plan and crisis management.

SUGGESTED READINGS:

1. Kunders, G.D. (2002) - Designing for Total Quality in healthcare, Prism Books Pvt. Ltd., Bangalore.
2. Kunders, G.D. (2004) - Facilities Planning and Arrangement in Healthcare, Prism Books Pvt Ltd. Bangalore.
3. Davies Llewellyn R & Macaulay HMC (1995) - Hospital Planning and Administration, Jaypee Brothers, New Delhi.
4. Sakharkar, B.M. (1998) - Principles of Hospital Administration & Planning - Jaypee Publishers New Delhi.
5. Goel, S.L. (2001 Vol 1-4) - Healthcare Systems and Management, Deep and Deep Publications, New Delhi
6. Srinivasan A.V. (2002) - Managing a modern hospital, Response Books, New Delhi
7. Sharma K.R., Sharma Yashpal (2003) - A handbook on Hospital Administration, Durga Printers, Jammu
8. Sharma, Madhuri (2003) - Essentials for Hospital Supportive Services, Jaypee Brothers, New Delhi
9. Tabish, Syed Amin - Hospital Planning, Organization and Management

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH34			3	0	0	3
SUBJECTTITLE:OPERATIONSMANAGEMENTINHEALTHCARE							
OBJECTIVE: Givesunderstandingaboutvariousoperationsrelatedtohospital administrationsuchaspurchaseprocedures ofhealthcareequipmentsandmaterials,storemaintenance,qualitymanagementandconductionofhealthcareevents							
OUT COMES <ul style="list-style-type: none"> • Explore the challenges and opportunities for improving healthcare operations; • Develop an understanding of the systems of care and how they translate into operational strategies and activities; • Understand the relationship between business strategy and operations (or the lack thereof); • Explore methods and tools for problem solving and decision making in healthcare operations; 							
Unit I HOSPITAL PURCHASE MANAGEMENT: Objectives and Elements of Purchasing- PurchasingSystem- Purchase Cycle- Purchase methods and Procedures; Planning and Selection of Equipment- Purchase,InspectionandInstallation;ImportofEquipment							
UnitIIHOSPITALSTORESMANAGEMENT: PlanningConsiderationofStores-InspectionandVerification of Materials- Storage of Materials-Codification and Standardization-Value Analysis- InventoryControl- Economic Order Quantity (EOQ), Distribution of Materials- Condemnation and Disposal; HospitalWastesManagement							
Unit III HOSPITAL MATERIALS AND MAINTENANCE MANAGEMENT: Functions of MaterialsManager- Information Systems for Materials Management; Policy and Procedures-Equipments Types andCharacteristics; Records,Responsibilities-Levelsof Maintenance; EquipmentUtilization andOperation-EquipmentRepairandMaintenance-EquipmentAudit							
EMPLOYABILITY							
Unit IV QUALITY ASSURANCE IN HOSPITALS: Patient safety and satisfaction, Patient feedbacksystem, Job Description of Quality Manager- Quality Steering Committee- Quality Council, Quality Audit;Quality Teams: Task Force, Quality Circle- ISO Certification; BS Mark, Accreditation: JCI, Quality AwardsScheme -MBNQA;NABH,Sixsigmain hospitals;Obstaclesto Practice Quality inHospitals							
UnitV HEALTHPROGRAM/EVENTMANAGEMENT: Healthcareprograms,campaignsandcamps;Program need analysis, Planning / Pre project phase (CPM & PERT Analysis), Execution phase – Manpowerandqualityservice deliveryrequirements,Postprojectimpactanalysis							
SUGGESTEDREADINGS: 1. DonnaDeeprosee,Project Management,CapstonePublishing,Oxford,2007 2. H.Kerzner,ProjectManagement:ASystemApproachttoPlanning,SchedulingandControlling,WileyEasternpub lication,2008 3. ShaktiGuptaandSunilKant,HospitalStoresManagement:AnIntegratedApproachJaypeePublications,New Delhi,India,2010 4. WHO,MaintenanceandRepairofLaboratory, Diagnostic,ImagingandHospitalEquipment,2006 5. WilsonCRM,HospitalWideQualityAssurance, Saunderspublication,2005 6. HughC. H.Kogh, TotalQualityManagementinHealthCare, LongmanPublication,2008 7. RogerEllisandDorothyWhittington,QualityAssuranceinHealthCare– AHandBook,EdwardAinoidpublication,1998							
2404							

SEM	THREE	NATURE	ELECTIVE	L	P	T	C	
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COURSECODE	20260EH35	3	0	0	3
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SUBJECTTITLE:MARKETINGMANAGEMENTOFHOSPITALANDHEALTHCARESERVICES

OBJECTIVE:
Givesbetterunderstandingaboutthewaystomarkethealthcareservices.Givesviewaboutthemarketing mixforhealthcareservices

OUTCOMES
CO101: Students will have an idea of the overall Managerial Functions which can be applied in any organizational set up
Basics of Hospital Administration
CO103: Students will have a general idea about the fundamentals of hospital administration Health Economics
CO105: Students will have the complete understanding about micro and macroeconomics Basics of Medical Sciences
CO107: Students will have a basic understanding of structure & functions of various organ system of a human body.
Students will have basic knowledge on various aspects of community medicine

Unit I APPLICATION OF MARKETING IN HEALTHCARE Concept of Marketing-Importance ofMarketingtoHealthcareOrganizations-ChallengesinPracticingMarketinginHealthcareIndustry-Marketing Intelligence, Information and Research System- Marketing Organization: Chart, FulltimeStaffandHiringConsultants

Unit II MARKETING MIX DECISIONSProduct(Service) Decisions- Nature and Characteristics ofServices- Marketing Approaches to New Services Development- Pricing Decisions - Place Decisions - PromotionDecisions-AdvertisinginHealthcareIndustry-MarketingStrategies-ServicePortfolioStrategy - Market Expansion Strategy - Target Market Strategy - Price Quality Strategy- Competitive PositioningStrategy.

UnitIII SOCIAL MARKETINGStepsin SocialMarketing- Cognitive,Action,BehaviorandValueChanges,Mediain social Marketing,Social media sources; Social Events and Printed sources; Onlinesources;Roleofsocialmarketinginhealthcare

Unit IV PUBLIC RELATIONS Introduction to Public Relations, Classification of Public from HealthcareMarketing Perspective, Identifying the Relevant Publics- Measuring Images and Attitude of the RelevantPublic-EstablishingImageGoalsfortheKeyPublics- DevelopingCostEffectivePublicRelationsStrategies- ImplementingActionsandEvaluatingResults;HealthServicePublicRelationsOfficer- ChangingRoleandResponsibilitiesofHealthService PRO.

Unit V COMMUNITY OPINION SURVEYS AND MARKET RESEARCH Market research – ModelQuestionnaire used in Healthcare Services; Public Relations Tools and Materials: Written and Audiovisual;Media:News,Events,SpeechesandTelephoneInformationServices;Dataanalysis;Researchreportpreparationandpresentation;Decisionmakingbasedonmarketresearch.

EMPLOYABILITY

- SUGGESTED READINGS:**
1. PhilipKotlerandRobertaN.Clarke,MarketingforHealthcareOrganizations,PrenticeHall Publication,2009
 2. RogerSilver,HealthServicePublicRelations,RadcliffeMedicalPressLtd.,2010
 3. JohnF.O’Malley,HealthcareMarketingSalesandServices:AnExecutiveCompanion,HealthAdministrationPress,2011
 4. G.D.Kunder,How to MarketYourHospital Without Selling Your Philosophy,Prism Books Pvt. Ltd.,2000
 5. PhilipKotler,JoelShalowitz,MD,MBA, RobertJ. Stevens,StrategicMarketingForHealthCare Organizations:BuildingACustomer-DrivenHealthSystem,JohnWileyandSonsInc.,Jossey–BassPublication,2008

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH36			3	0	0	3

SUBJECT TITLE:

COMMUNITY HEALTH AND MANAGEMENT OF NATIONAL HEALTH PROGRAMMES

OBJECTIVE:

After completion of community health and management of National health programs module, students will be able to recognize and identify the elements in designing the strategies for health care delivery for community.

OUTCOMES

- To appreciate the Educational heritage of India.
- To understand the nature of Education as a discipline and its correlation with other disciplines.
- To comprehend the basic features of Indian Constitution and its implication in Education.
- Critically examine the pivotal issues of contemporary India.
- Analyse vision, aims of education, and recommendations of various commissions after independence in shaping the present educational system of India.
- Evaluate the basic concepts/issues of Education with reference to NCF (2005) and NCFTE(2009).

UNIT – I Concepts in Health and Disease – Introduction of medicine, public health and community health; Definition of health: the determinants and relative concept; Agent – Host – Environmental factors in health and disease, indices used in measurement of health, levels of prevention; Epidemiology of common communicable diseases and chronic non-communicable diseases and condition.

UNIT – II Health care delivery system in India: Introduction, Demography and Family Planning; Maternal and child health; Urban health; Occupational health; Mental health; Community geriatrics; Essential Medicines and Counterfeit Medicines.

UNIT – III Health Education: Definition, approach in health education, methods, barrier to effective communication, principles of health education; International Health Regulations and International classification of diseases,

UNIT – IV International Health agencies and organizations: WHO, UNICEF, UNOP, World Bank, UNFPA, CARE, IHO, Notifiable diseases.

EMPLOYABILITY

UNIT –

V National Health Programs: Objectives, strategy, achievements, critical analysis; Cancer screening and national cancer control program, National AIDS Control program and NACO, National leprosy eradication program, Universal immunization program, National vector borne disease control program, RNTCP, RCH, National Program for control of blindness, National Health Policies, National Population Policy, National Rural Health Mission.

SUGGESTED READINGS:

1. K. Park: Park's Textbook of Preventive and Social Medicine, M/s Banarsidas Bhanot Publishers
2. Ann Lindstrand, Hans Rosling: An Introductory Textbook, Global Health
3. A. B. Christie: Infectious Diseases - Epidemiology and Clinical Practice, Churchill Livingstone.
4. Rameshwari Pandya: Health, Family Planning and Nutrition in India, New Century Publications.
5. S. L. Goel: Health Care Policies and Programmes, Deep and Deep Publications.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EH37		3	0	0	3
SUBJECT TITLE: MANAGEMENT OF CLINICAL AND SUPER SPECIALTY SERVICES IN HOSPITALS							
<p>OBJECTIVE: This course is aimed at developing awareness among students regarding concept of location, layout and the infrastructure and staff requirements. They would be able to enumerate general procedures and policies and procedures followed in each of these.</p> <p>OUTCOMES</p> <p>CO1: Describe the health systems of various Countries including India</p> <p>CO2: Discuss and learn public health care system in India</p> <p>CO3: Develop, implement and manage various public health programs</p> <p>CO4: Critically analyze the various components of health care delivery system in India</p> <p>CO5: Apply various principles of planning and management in implementing health projects and programmes.</p>							
<p>UNIT – I Hospital Management Of Clinical Services (Medical + Ancillary): Detailed Management, Layout, Design of- OPD Services, Emergency Services, Clinical Laboratories, Radiological Services, Operation Theatres.</p> <p>UNIT-II Overview of Management Layout & Design of: Radiation Therapy department, Nuclear Medicine, Labour and Delivery Suite, Physical Therapy, Pulmonary Medicine, Cath Lab.; Equipment Planning, utilization survey of super-specialty service equipment.</p> <p>UNIT – III Clinical services-3: Operation theatre – Intensive care units – Hospital acquired infections – Sterilization – Nursing services – Ward management.</p> <p>EMPLOYABILITY</p> <p>UNIT-IV Nursing Services: Detailed Layout, Design & Management of: General Nursing Unit including general wards and private rooms, Intensive Care Units; Decision making in nursing profession: Nurse-Patient relationship, health education to patients; Pediatric Nursing Unit, Obstetric Nursing Unit, Psychiatric Nursing Unit, Isolation Rooms, ICU/CCU, Newborn Nursery.</p> <p>UNIT-V Emerging areas in Hospital Services: Alternative and Complimentary medicine, Palliative medicine, promotive Healthcare, home healthcare; Rehabilitation and De-addiction – Role of hospitals, duties and responsibilities of clinical and paraclinical staff.</p>							

SUGGESTED READINGS:

1. B.M.Sakhankar:PrinciplesofHospitalAdministration&Planning,JayPeePublications.
2. G.D.Kunders:Hospitals-FacilitiesPlanningandManagement,TataMcGrawHill.
3. JaydeepDasGupta:HospitalAdministrationandManagement–AComprehensiveGuide,JayPeePublications.
4. ShaktiKumarGupta,SunilKant,RChandreshakhar:ModernTrendsInPlanningandDesigningofHospitals-Principles&Practice,JayPeePublications.
5. A.V.RamasastriSrinivasan:ManagingaModernHospital, ResponseBooks.
6. ShaktiGupta,SunilKant:HospitalandHealthcareAdministration, JaypeePublications.
7. J.ChristopherFarmer:HospitalEmergencyManagementGuidebook,JCIResource.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EH38		3	0	0	3
SUBJECTTITLE: PATIENTCAREMANAGEMENT							
OBJECTIVE: To understand the processes and details related to effective patient care and to further increase the satisfaction levels of patients							
OUTCOMES							
CO1: Describe the health systems of various Countries including India							
CO2: Discuss and learn public health care system in India							
CO3: Develop, implement and manage various public health programs							
CO4: Critically analyze the various components of health care delivery system in India							
CO5: Apply various principles of planning and management in implementing health projects and programmes.							
Unit I Patient centric management: Concept of patient care, Patient-centric management, Organization of hospital departments, Roles of departments/managers in enhancing care, Patient counseling & Practical examples of patient centric management in hospitals. Patient safety and patient risk management.							
Unit II Quality in patient care management: Defining quality, Systems approach towards quality, Towards a quality framework, Key theories and concepts, Models for quality improvement & Variations in practice.							
Unit III Patient classification systems and the role of case mix: Why do we need to classify patients, Types of patient classification systems, ICD 9 (CM, PM), Casemix classification systems, DRG, HBG, ARDRG, Casemix innovations and Patient empowering classification systems.							
Unit IV Medical ethics & auditory procedures: Ethical principals, Civic rights, Consumer protection act, CPA, Guideline of the CPA, Patient complaints powers & procedures of the district forum, State and National commission, Role of supreme court, Patient appeals, Autopsy, Tort liability, Vicarious liability, Medical negligence, Central & state laws, Use of investigational drugs, Introduction/need & procedures for medical audit, Audit administration & Regulating committees. Confidentiality and professional secrecy, ethics of trust and ethics of rights – autonomy and informed consent, under trading of patient rights – universal accessibility – equity and social justice, human dignity.							
Unit V Patient Medical Records: Policies & procedures for maintaining medical records. e-records, legal aspects of medical records, its safety, preservation and storage.							
EMPLOYABILITY							

SUGGESTED READINGS:

1. Goel SL & Kumar R. 2004. Hospital Core Services: Hospital Administration of the 21st Century. Deep Deep Publications Pvt Ltd: New Delhi
2. Gupta S & Kant S. 1998. Hospital & Health Care Administration: Appraisal and Referral Treatise. Jaypee: New Delhi
3. Harris MG & Assoc. 2003. *Managing Health Service: Concepts & Practices*. MacLennan + Petty: Sydney
4. Kelly DL. 2006. Encyclopaedia of Quality Management in Hospitals & Health Care Administration. Vol 1-6. Pentagon Press: Chicago
5. Kilpatrick AO & Johnson JA. 1999. Handbook of Health Administration & Policy. Marcel Dekker Inc: New York
6. Kumar A. 2000. Encyclopaedia of Hospital Administration & Development: Volume I. Anmol Publications Ltd: New Delhi.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH39			3	0	0	3

SUBJECTTITLE: HEALTHRELATEDLAWSANDETHICS

OBJECTIVE:

ToUnderstandLawsrelatingtoHealthservices,Legalreports, License,RiskManagement.

OUTCOMES

1. Demonstrate systematic knowledge of the substantive law relevant to a range of key areas of healthcare law;
2. Demonstrate systematic knowledge of major western traditions in bioethics and key ethical principles relevant to the provision of healthcare;

Demonstrate a critical understanding of how these different traditions and principles apply to current key issues in healthcare law;

UNIT-I:

Laws relating to Hospital formation: Promotion-Forming society-The Companies Act-Law of Partnership-ASample ConstitutionfortheHospital-The TamilNaduClinicsAct.

UNIT-II:

Laws relating Purchases and funding: Law of contracts-Law of Insurance-Export Import Policy-FEMA-ExemptionofIncome Tax forDonations-TaxObligations:FilingReturnsandDeductionsatSource.

UNIT-III:

Laws pertaining to Health: Central Births and Deaths Registration Act, 1969- Recent amendments – MedicalTerminationofPregnancyAct,1971–InfantMilkSubstitutes,FeedingBottlesandInfantFoodAct,1992.

UNIT- IV:

Laws pertaining to Hospitals:TransplantationofHumanOrgansAct,1994–Pre-natalDiagnosticTechniques (Regulation and Prevention of Misuse) Act, 1994 – Medical Negligence – Medico Legal Case –Dying Declaration-MCIact on medical education. The Biomedical Waste (Managementand Handling)Rules- RadiationSafetySystem.

UNIT- V:

Laws pertaining toManufactureand saleofDrugs:Drugsand CosmeticsActs,1940– Pharmacy Act,1948– Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 – Poison Act, 1919 – Legislation forTobaccocontrol.

EMPLOYABILITY

SUGGESTEDREADINGS:

1. TheLawofHealthCareAdministrations–StuartShowalter
2. DynamicsofIndustrialRelations–C.B.Memoria
3. Industriallaws– N.D.Kapoor

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH42			3	0	0	3

SUBJECTTITLE:MEDICALTOURISM

OBJECTIVE:

To understand the Significance of Medical Tourism, Role of government, Communication for medical tourists. This will enable students to learn effects of medical tourism in nation's economy, Pricing of Medical Services, Emerging trends on Medical Tourism.

COURSE OUTCOME

Define the basic concepts related to medical tourism

Have information about intermediary institutions and organizations in medical tourism

Discuss medical tourism practices in Turkey and the World

Explain digital transformation in the field of health

Unit-I

Introduction to Medical Tourism – History – Evolution of Medical Tourism – Scope of Medical Tourism – Importance-Medical Tourism Process.

Unit-II

Medical Tourism Destinations – National & International Destinations - Travel Retailing and Logistics for Health Tourism.

Unit-III

Marketing Concepts and Strategies-Hospitality and Hotel Industry linkages- Spa and Wellness Tourism.

Unit-IV

Medical Tourism-Ethical, Legal and Social Concerns-Medical Tourism-Issues & Challenges.

EMPLOYABILITY

Unit-V

Quality Standards in Medical Tourism-Medical Tourism-The Future of Health Services – International Healthcare Accreditation.

SUGGESTED READINGS:

1. Milica Z., Bookman Karla R. Bookman, Medical Tourism in Developing Countries, Palgrave Macmillan 2007.
2. Raj Pruthi, Medical Tourism in India, Arise Publishers & Distributors, 2006.
3. RNCOS, Opportunities in Medical Tourism in India (2007), RNCOSE-Services Pvt. Ltd., 2006.
4. Michael D. Horowitz Jeffrey A. Rosensweig, Medical Tourism – Health Care in The Global Economy (Trends), American College of Physician Executive, 2007.

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EH43		3	0	0	3

SUBJECT TITLE: HOSPITAL ARCHITECTURE, PLANNING, DESIGN AND MAINTENANCE

OBJECTIVE:

To understand the Significance of Medical Tourism, Role of government, Communication for medical tourists. This will enable students to learn effects of medical tourism in nation's economy, Pricing of Medical Services, Emerging trends on Medical Tourism.

COURSE OUTCOME

At the end of the course, the students shall have acquired knowledge of the process involved in addressing a design problem with emphasis on site planning.

UNIT – I: Hospital as a system: Definition of hospital – classification of hospitals – changing role of hospitals – role of hospital administrator – hospital as a system – hospital & community.

UNIT – II: Planning: Principles of planning – regionalization - hospital planning team – planning process – size of the hospital – site selection – hospital architect – architect report – equipping a hospital – interiors & graphics – construction & commissioning – planning for preventing injuries – electrical safety

UNIT – III: Technical analysis: Assessment of the demand and need for hospital services – factors influencing hospital utilization – bed planning – land requirements – project cost – space requirements – hospital drawings & documents – preparing project report.

UNIT – IV: Hospital standards and design: Building requirement – Entrance & Ambulatory Zone – Diagnostic Zone – Intermediate Zone – Critical zone – Service Zone – Administrative zone – List of Utilities – Communication facility – Biomedical equipment Voluntary & Mandatory standards – General standards – Mechanical standards – Electrical standards – standard for centralized medical gas system – standards for biomedical waste.

EMPLOYABILITY

UNIT – V: Facilities planning: Transport – Communication – Food services – Mortuary – Information system – Minor facilities – others.

REFERENCE BOOKS

1. Designing for total Quality in Health Care - G.D. Kunders
2. Modern Trends in Planning and Designing of hospitals – Gupta S.K. Sunil Kant Chandra Shekhar. R. Satpathy
3. Hospital and Nursing Homes Planning, Organisations & Management - Syed Amin Tabish
4. Hospitals, Facilities Planning and Management - G.D. Kunders

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SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EH44			3	0	0	3
SUBJECTTITLE: HOSPITALWASTEMANAGEMENT							
<p>Objective:TheObjectiveof theCourseisto familiarizethe learnerwiththeimportance,techniquesandthe proceduresinvolvedinthemanagementof HospitalWaste.</p> <p>COURSE OUTCOME</p> <p>Learn basic concepts of solid waste management, beginning from source generation to waste disposal in a system of municipality organizational structure.</p> <ul style="list-style-type: none"> • Develop understanding on various technological applications for processing of waste and their disposals in various ways. • Acquire knowledge on waste to energy productions in the perspectives of sustainable development. • Apply basic concepts in hazardous waste management and integrated waste management for urban areas. <p>UNIT-1:Hospital Hazards:Meaning–Types–Physical–Biological Mechanical–Psychological – ItsImpactonEmployees–Preventivemeasures.</p> <p>UNIT-2: HospitalHazardsManagement:Meaning–Need–Principles–Purpose.</p> <p>UNIT-3: Control of Hospital Acquired Infection: Types of Infection – Common Nosocomial Infection andtheirCausativeAgents–PreventionofHospitalAcquiredInfection–RoleofCentral SterileSupplyDepartment– InfectionControlCommittee–Monitoring andControlorCross-Infection–StaffHealth.</p> <p>UNIT-4:BiomedicalWasteManagement:Meaning–CategoriesofBiomedicalwastes–Disposalofbiomedical waste products – Incineration and its importance – Standards for Waste Autoclaving, MicroWavingandDeepBurial–Segregation–Packaging–Transportation–Storage.</p> <p>UNIT-5: Human Waste Disposal and Sewage Disposal: Diseases carried from excreta – Sanitation barrier – Methods of Excreta disposal – Sewage wastes:Meaning – Composition –Aims of Sewage disposal – DecompositionofOrganicMatter–ModernSewageTreatment–Drawbacksofimproperdisposalofwastes –Solidand liquid.</p> <p>EMPLOYABILITY</p> <p>ReferenceBooks: 1.Sharma– HolisticapproachtoHospitalWasteManagementpublishedbyDept.ofHospitalAdministration– AIIMS,NewDelhi,2006.</p>							

TOURISM

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EI33		3	0	0	3
SUBJECT TITLE: TOURISM PRINCIPLES, POLICIES AND PRACTICES							
OBJECTIVE: To realize the potential of tourism industry in India. To understand the various elements of Tourism Management and familiarize with the Tourism policies in the national and international context.							
COURSE OUTCOME Analyze, understand, and innovate the deliverables of tourism sector Create competitive edge to destinations through managerial skills Acquire entrepreneurial skill sets Possess vibrant interpersonal qualities Possess learning acumen							
<p>Unit- I Tourism; an overview: Elements, Nature and Characteristics - Typology of Tourism - Classification of Tourists - Tourism network - Interdisciplinary approaches to tourism - Historical Development of Tourism - Major motivations and deterrents to travel.</p> <p>Unit-II Tourism Industry; Structure and Components: Attractions - Accommodation - Activities - Transportation - F&B - Shopping - Entertainment - Infrastructure and Hospitality - Emerging areas of tourism - Rural, Eco, Medical, MICE, Literary, Indigenous, Wellness, Film, Golf, etc., - Ideals of Responsible Tourism - Alternate Tourism - Case Studies on International Tourism.</p> <p>Unit-III Tourism Impacts - Tourism Area Life Cycle (TALC) - Doxey's Index - Demonstration Effect - Push and Pull Theory - Tourism System - Mathieson and Wall Model & Leiper's Model - Stanley Plog's Model of Destination Preferences - Demand and Supply in tourism - Tourism regulations - Present trends in Domestic and Global tourism - MNC's in Tourism Industry.</p> <p>Unit-IV Tourism Organizations: Role and Functions of World Tourism Organization (WTO), Pacific Asia Travel Association (PATA), World Tourism & Travel Council (WTTC) – Ministry of Tourism, Govt.</p> <p>EMPLOYABILITY of India, ITDC, Department of Tourism, Govt. of Puducherry, FHRAI, IHA, IATA, TAAI, IATO.</p> <p>Unit-V Overview of Five Year Plans with special reference to Eleventh Five Year Plan for Tourism Development and Promotion, National Action Plan, National Tourism Policy – Code of conduct for safe and Sustainable Tourism for India.</p>							
TEXTBOOKS							
<ol style="list-style-type: none"> Charles R. Goeldner & Brent Ritchie, J.R. (2006), Tourism, Principles, Practices, Philosophies, John Wiley and Sons, New Jersey. Bhatia A. K. (2001), International Tourism Management, Sterling Publishers, New Delhi. 							
REFERENCES							
<ol style="list-style-type: none"> Page J. Stephen & Brunt Paul (2007), Tourism - A Modern Synthesis, Thomson Publishers, London. Chuck Y. Gee, James C. Makens & Dexter J. L. Choy (1989), The Travel Industry, Van Nostrand Reinhold, New York. Ray Youell (1998), Tourism - an introduction, Addison Wesley Longman, Essex. Ghosh Bishwanath (2000), Tourism and Travel Management, Vikas Publishing House, New Delhi. 							

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI34			3	0	0	3

SUBJECT TITLE: TOURISM PRODUCTS OF INDIA

OBJECTIVE:

- To study the vast Tourist resources of India;
- To conceptualize a tour itinerary based on variety of themes; and To identify and manage emerging tourist destinations.

COURSE OUTCOME

Understand fundamentals of tourism from the management, marketing and financial perspectives. • understand the concepts of travel and tourism, the framework of the system, types and form of tourism as well as the impacts of tourism. • describe the different types tourism resources of India, their importance in tourism and management.

Unit - I Tourism products: Definition, Types and unique features - Tourism resources of India – Natural, Sociocultural, Diversities in Landform & Landscape - Outstanding Geographical features - Climate, Flora & Fauna.

Unit - II Natural resources: Wildlife sanctuaries - National parks - Biosphere reserves - Mountain Tourist Resources and Hill stations - Islands - Beaches - Caves & Deserts of India.

Unit - III Major tourism circuits of India: Inter State and Intra-State Circuits - Religious Circuits - Heritage Circuits - Wildlife Circuits. Cases of select destinations - Kerala, Rajasthan & Goa.

Unit - IV Manmade resources: Adventure sports - Commercial attractions - Amusement Parks - Gaming - Shopping - Live Entertainments - Supplementary accommodation - House boats - Tree houses - Home stays - Tourism by rail - Palace on wheels - Deccan Odyssey & Golden chariot.

Unit - V Emerging Tourism Destinations of India: Ecotourism - Rural Tourism - Golf Tourism - Wine Tourism - Camping Tourism - Medical Tourism - MICET Tourism - Pilgrimage Tourism.

EMPLOYABILITY

TEXTBOOKS

1. S.P. Gupta (2002), Cultural Tourism in India, Indraprastha Museum of Art and Archaeology, New Delhi.

REFERENCES

1. Stephen Ball (2007), Encyclopaedia of Tourism Resources in India, B/H.
2. Manoj Dixit (2002), Tourism products, New Royal Book Co. Lucknow.
3. Norman Douglas. Ed. (2001), Special Interest Tourism,
4. John Wiley & Sons, Australia. Sarina Singh (2008), Lonely Planet India.
5. Robinet Jacob (2007), Indian Tourism Products, Abhijeet Publications, Delhi.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI35			3	0	0	3

SUBJECT TITLE: DESTINATION PLANNING AND DEVELOPMENT

OBJECTIVE:

- To facilitate the assessment of the tourism potential of a destination and prepare tourism development plans as well as marketing techniques;
- To familiarize with the destination branding practices; and
- To introduce advanced analysis and research in the field of destination development.

COURSE OUTCOME

To understand the basic terminologies of tourism destination planning and development >> To develop conceptual clarity about the fundamental concepts of destination planning and development >> To identify the steps involved in tourism planning process >> To know the importance of destination planning and development

Unit-1 Destination Development - Types of destinations, Characteristics of destinations - Destinations and products-Destination Management Systems-Destination planning guidelines- Destination Selection Process-The Values of Tourism.

Unit-II Destination Planning Process and Analysis-National and Regional Tourism Planning and Development-Assessment of tourism potential-Planning for Sustainable Tourism Development-Contingency Planning - Economic, Social, Cultural and Environmental considerations - Demand and supply match-Design and innovations.

Unit-III Destination Image Development-Attributes of Destinations: Person's determined image, Destination determined image, measurement of destination image - Destination branding perspectives and challenges-Creating the Unique Destination Proposition-Place branding and destination image-Destination image formation process; unstructured image-Product development and packaging-Destination branding and the web-Case Study of Puducherry as a brand.

Unit-IV Destination Promotion and Publicity - Six 'A's framework for tourism destinations - The dynamic wheel of tourism stakeholders - Destination Marketing Mix - Destination Competitiveness - Distribution Channels-Marketing Communication and Strategies.

Unit-V Institutional Support: Public Private Partnership (PPP) - National Planning Policies for Destination Development-WTO Guidelines for Planners-Role of urban civic bodies: Town planning-Characteristics of rural tourism planning- Environmental Management Systems - Destination Vision- The focus of Tourism Policy: the competitive sustainable destination- Destination Mapping (practical assignment).

EMPLOYABILITY

TEXTBOOKS

1. C. Gunn (2002), Tourism Planning: Basic, Concepts and Cases, Cognizant Publication.

REFERENCES

1. Nigel Morgan, Annette Pritchard & Roger Pride (2001), Destination branding: Creating the Unique Proposition, Butterworth and Heinemann.
2. Richard W. Butler (2006), The Tourism Area Life Cycle: Applications and Modifications, Channel View Publications.
3. Claire Haven Tang & Eleri Ellis Jones (2005), Tourism SMEs, Service Quality and Destination Competitiveness, CAB International.
4. Shalini Singh, Dallen J. Timothy & Ross Kingston Dowling (2003), Tourism in Destination Communities, CAB International.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EI36		3	0	0	3

SUBJECTTITLE: TRAVELAGENCYANDTOUROPERATIONS

OBJECTIVE:

- Tounderstandthesignificanceoftravelagencyandtouoperationbusiness;
- Toknowthecurrenttrendsandpracticesinthetourismandtraveltradesector;
- Todevelopadequateknowledgeandskillsapplicabletotravelindustry.

COURSE OUTCOME

defines travel and tourism concepts.

defines differences between travel and torism concepts.

explains historical development of travel and tourism concepts.

lists factors which are effective in the definition of travel.

UNIT-ITravel Trade - Historical Perspectives - Emergence of Thomas Cook and AmericanExpress Company - Types of Tour Operators - Wholesale and Retail Travel Agency business -Linkages and Integration with the Principal Service Providers - the Changing ScenarioofTravelTrade.

UNIT-IITravelAgencyandTourOperationBusiness-FunctionsofTravelAgency-Settingupafull-fledged Travel Agency -Sources of Income of a travel agency -Diversification ofBusiness - Travel Insurance, Forex, Cargo & MICE - Documentation - IATA Accreditation - RecognitionfromGovernment.

UNIT-III Itinerary Planning & Development - Meaning, Importance and Types of Itinerary - Resources and Steps for Itinerary Planning - Do's and Dont's of Itinerary Preparation - TourFormulation and Designing Process - FITs & Group Tour Planning and Components - SpecialInterestTours(SITs).

UNIT-IV Tour Packaging & Costing - Importance of Tour Packaging - Classifications of TourPackages - Components of Package Tours - Concept of costing - Types of costs - Componentsof tour cost - Preparation of cost sheet - Tour pricing - Calculation of tour price - Pricingstrategies-TourpackagesofThomasCook,SOTC,Cox&KingsandTCI.

EMPLOYABILITY

UNIT-VRoleandResponsibilityofTravelTradeAssociations:Objectives- RolesandfunctionsofUFTAA,PATA,ASTA,TAAL,IATO,ATAOI,ADTOI,IAAI,FIYTO,TAFI.

TEXTBOOKS

1. Chand, M. (2002), *Travel Agency Management: An Introductory Text*, Anmol Publications Pvt. Ltd., New Delhi.
2. Negi, J. (2005), *Travel Agency Operations: Concepts and Principles*, Kanishka, New Delhi.

REFERENCES

1. Holloway, J. C. (2002), *The Business of Tourism*, Prentice Hall, London, pp. 220-279.
2. Roday, S., Biwal, A. & Joshi, V. (2009), *Tourism Operations and Management*, Oxford University Press, New Delhi, pp. 164-296.
3. Goeldner, R. & Ritchie, B. (2010), *Tourism, Principles, Practices and Philosophies*, John Wiley & Sons, London.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EI37		3	0	0	3

SUBJECT TITLE: Hospitality Management

OBJECTIVE:

- To understand the essentials of hospitality industry;
- To familiarize with resort and event management; and
- To do project work in the above areas.

COURSE OUTCOME

Identify and apply business concepts and skills relevant to the operational areas of hospitality management. Describe and apply the fundamental principles of leadership and model the behavior of effective leaders.

UNIT-I Introduction to Hospitality Industry: Classification of Hotels - Star Rating of Hotels - Classification on the basis of size, Location, Clientele, Duration of stay, level of Service- Classification on the basis of ownership - Alternative Accommodations - Hotel Tariff Plans - Types of Guest Rooms.

UNIT-II Hotel Organization: Need for Organizational - Organizational charts, major departments of a hotel - Front Office, Housekeeping, Food and Beverage Service Departments, Food Production, Engineering and Maintenance, Accounts, Human Resource, Security, Sales and Marketing, Purchase etc..

UNIT-III Room Reservations: Registration - Allotment of rooms - Stay, Departure - Handling FIT-GIT-Guest Services- Various Guest Services- Handling guest mail- Message Handling - Custody and control of keys - Guest paging - Safe deposit locker, left luggage handling, wakeup call, Handling Guest Complaints.

EMPLOYABILITY

UNIT-IV Evaluating hotel Performance: Methods of Measuring Hotel performance - Occupancy ratio - Average Daily rate, Average Room rate per guest - Rev PAR - Market share Index- Evaluation of hotel by Guest.

UNIT-V Yield Management: Elements of yield management, Measuring yield in the Hotel industry, benefits of yield Management, Challenges or problems in yield management.

TEXTBOOKS

1. JagmohanNegi(1997),ProfessionalHotelManagement,S.Chand,NewDelhi
2. G.Raghubalan&SmriteeRagubalan:HotelHousekeepingoperationsandManagement.

REFERENCES

1. JagmohanNegi,HotelsforTourismDevelopment,S.Chand,NewDelhi.
2. JatashankarRTewari(2009),HotelfrontofficeoperationsandManagement,Oxfordpublication NewDelhi.
3. GrayandLigouri(2000),HotelandMotelManagement andOperations,PHI,NewDelhi.
4. SudheerAndrews(2009),HotelFrontOfficeTrainingManual,TataMcGrawHill,Bombay.
5. JohnCousinsDavidFoskett&CaileinGillespie(2002),FoodandBeverageManagement,Pears onEducation,England.
6. Arthur&Gladwell,HotelAssistantManager(Londoncommunicate,Barril,Jenkins)

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI38			3	0	0	3

SUBJECT TITLE: INDIAN CULTURE AND HERITAGE

OBJECTIVE:

- To study the richness and diversity of Indian culture;
- To evaluate the contemporary trends of Indian culture; and
- To acknowledge and appreciate the co-existence of different cultural and religious practices of India.

COURSE OUTCOME

Students will have developed a better understanding of important issues related to gender in contemporary India.

Unit - I Glimpses of Indian cultural history - Pre and Post Vedic periods - Ancient Indian Literatures - Sacred Literature - Secular Literature - Ancient Society & Culture - Ashramas - Varna System - Purushartha - Indian vs. Western Culture.

Unit - II Religions of India - Religious Shrines & Centers - Hindu, Buddhist, Jain, Sikh, Muslim, Christian and others - Basic Tenets - Indian Vs Western Philosophy.

Unit - III Cultural Heritage - Ayurveda, Yoga and meditation - Performing Arts: Dance Forms - Music - Vocal & Instruments - Folk Arts - Indian Paintings and Sculpture.

EMPLOYABILITY

Unit - IV Architectural Heritage - Rock cut Architecture - Buddhist Architecture - Gandhara & Mathura Schools of Art - Hindu Temple Architecture - Indo-Islamic Architecture - Modern Architecture - Forts, Palaces and Havelies.

Unit - V Museums and Art Galleries - Fairs and Festivals - Indian Cuisine - Traditional Arts and Crafts - World Heritage sites in India - Problems and Prospects of Cultural Tourism in India.

TEXTBOOKS

1. Basham, A.L. (1988), The Wonder that was India, Rupa and Co., Delhi

REFERENCES

1. S.P. Gupta (2002), Cultural Tourism in India, Indraprastha Museum of Art and Archaeology, New Delhi.
2. Hussain, A.K. (1987), The National Culture of India, National Book Trust, New Delhi.
3. Robinet Jacob (2007), Indian Tourism Products, Abhijeet publications.
4. Surendra Sahai (2006), Indian Architecture: Hindu Buddhist and Jain, Prakash Books.
5. The Gazette of India: History and Culture, Vol. 2, publication division, Ministry of Information and Broadcasting, Government of India, 1988.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EI39		3	0	0	3

SUBJECTTITLE: TourismMarketing

OBJECTIVE:

- Toexposethestudentsto conceptsandcomponentsofmarketing;
- Toacquaintthemwithtourismsspecificmarketingskills;and
- Tofamiliarizethemwiththecontemporarymarketingpractices.

COURSE OUTCOME

Understand the concept of tourism, basic about tourism industry. access and appropriately disseminate accurate and detailed product knowledge and destination information about different types of tourist. develop ongoing professional development strategies and plans to enhance industry knowledge and leadership skills for tourism industry sectors.

Unit I Evolution of Marketing - Marketing for Tourism - The Tourism Product - Features of TourismMarketing- MarketingFunctions-MarketResearch-TourismMarketingMix.

Unit II Understanding the Market and the Consumer- Marketing Environment- ConsumerBehaviour - Buyer Decision Process - Demand Forecasting - Market Segmentation - Targeting -MarketPositioning.

Unit III The 4 P's of Marketing : Product Designing - Branding and Packaging - New ProductDevelopment- ProductLifeCycle:Price:StrategiesandApproaches;Place:ChannelsofDistribution, Promotion: Advertising - Sales Promotion - Publicity - Personal Selling; Other P's:People,PhysicalEvidenceandProcess.

Unit IV Marketing of Tourism & Related Activities - Trends in Tourism Marketing – Marketing ofDestinations, Airlines, Hotels, Resorts, Travel Agencies, Events and other Tourism sub - sectorsandproducts.

UnitVDevelopingMarketingSkillsforTourism-SelfMotivation-TeamBuilding- PersonalityDevelopment-Creativity&Innovation-InnovativeProductsinTourism- InternationalPerspectiveandContemporaryTrends.

TEXTBOOKS

1. ManjulaChaudhary(2010), TourismMarketing, OxfordUniversityPress, NewDelhi.

REFERENCES

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI42			3	0	0	3

SUBJECT TITLE: ECOTOURISM

OBJECTIVE:

- To understand the significance of ecotourism;
- To comprehend the theories and practices of ecotourism;
- To be familiar with the model ecotourism projects; and
- To use the theoretical knowledge to manage ecotourism resources.

COURSE OUTCOME

Understand the concept of tourism, basic about tourism industry. ♣ CO2: access and appropriately disseminate accurate and detailed product knowledge and destination information about different types of tourist. ♣ CO3: develop ongoing professional development strategies and plans to enhance industry knowledge and leadership skills for tourism industry sectors

UNIT-I Fundamentals of Ecology - Basic Laws & ideas in Ecology - Function and Management of Ecosystem - Biodiversity and its Conservation - Pollution - Ecological Foot Prints - Relationship between Tourism & Ecology.

UNIT-II Ecotourism - Evolution, Principles, Trends and Functions of Ecotourism - Mass Tourism Vs Ecotourism - Typology of Eco-tourists - Ecotourism Activities & Impacts - Western Views of Ecotourism - Quebec Declaration 2002 - Kyoto Protocol 1997 - Oslo Declaration 2007.

UNIT-III Ecotourism Development - Sustainable Ecotourism - Resource Management - Socio-economic Development - Ecotourism Policies, Planning and Implementation - Eco-friendly Facilities and Amenities - Carrying Capacity - Alternative Tourism - Responsible ecotourism - Ecotourism Programming.

UNIT-IV Conservation of Ecotourism - Protected Area Management through Ecotourism - stakeholder Engagement - Community Participation - Types of Participation, Issues and Challenges - Ecotourism Projects - Case Studies on Periyar National Park, Thenmala Eco-Project, Similipal Ecotourism Project, Sunderban Ecotourism Project, Kaziranga National Park, Run of Kutch, Nandadevi Biosphere Reserve, Corbett National Park, Gulf of Mannar, Kruger National Park, South Africa.

UNIT-V Ecotourism Development Agencies - Role of the International Ecotourism Society - the UNWTO, UNDP, WWF - Department of Forest and Environment - Government of India, ATREE, EQUATIONS.

EMPLOYABILITY

TEXTBOOKS

1. Fennel, D. A. (1999), Ecotourism- An Introduction, Routledge Publication.

REFERENCES

1. Weaver, D. (2001), the Encyclopedia of Ecotourism, CAB International.
2. Fennel, D. A. (2002), Ecotourism Policy and Planning, CAB International, USA.
3. Sukanta K Chaudhury, Cultural, Ecology and Sustainable Development, Mittal, New Delhi.
4. Ralf Buckley (2004), Environment Impacts of Ecotourism, CABI, London.
5. Ramesh Chawla (2006), Ecology and Tourism Development, Sumit International, New Delhi.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI43			3	0	0	3

SUBJECT TITLE: Event Management

OBJECTIVE:

To familiarize the students with the essentials of Event Management; To understand the potential of MICE and Event Tourism; and To enable the student to take up project work in the above areas..

COURSE OUTCOME

- Analyze the role of events in image building
- Explain all the steps of planning and organizing an event
- Plan and organize events
- Discuss ways of strategic marketing and media planning for events
- Demonstrate knowledge and ability to identify risk areas, evaluate safety measures

UNIT I Introduction to Events: Scope - Nature and Importance - Types of Events - Unique features and similarities-Practices in Event Management-Keysteps to a successful event.

UNIT II The Dynamics of Event Management: Event Planning and organizing - Problem Solving and Crisis Management - Leadership and Participants Management - Managing People and Time - Site and Infrastructure Management.

UNIT III Introduction to MICE: Planning MICE, Components of the Conference Market, Characteristics of Conferences and Conventions, MICE as a supplement to Tourism, the nature and demand of Conference markets- The Economic and Social significance of Conventions, process of Convention Management.

UNIT IV Event Marketing - Customer care - Marketing equipments and tools - Promotion, Media Relations and Publicity - Event Co-ordination - Visual and Electronic Communication - Event Presentation - Event Evaluation - Case Studies of events of National and International importance.

UNIT V Travel Industry Fairs - Benefits of Fairs - ITB, WTM, BTF, TTW, FITUR, KTM, IITM, CII-Events, PATATravelMart.

EMPLOYABILITY

TEXTBOOKS

1. Leonard H. Hoyle (2002), Event Marketing, John Wiley and Sons, New York.
2. Anton Shone & Bryn Parry (2002), Successful Event Management, Cengage Learning.

REFERENCES

1. Bhatia A. K. (2001), Event Management, Sterling Publishers, New Delhi.
2. David C. Watt (1998), Event Management in Leisure and Tourism, Pearson, UK.
3. Joe Goldblatt (1997), Special Events - Best Practices in Modern Event Management, John Wiley and Sons, New York.
4. Avrich Barry (1994), Event and Entertainment Marketing, Vikas, New Delhi.
5. Panwar J. S. (1998), Marketing in the New Era, Sage, New Delhi.

SEM	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EI44			3	0	0	3

SUBJECT TITLE: E-TOURISM

OBJECTIVE:

- To understand emerging business models in tourism and travel industry;
- To study the impact of Information Technology on tourism and travel sector;
- To explore the scope of entrepreneurship in the emerging e-tourism business

COURSE OUTCOME

Analyze the various components of Tourism and to describe how they coincide each other. PO2: Depicts the interrelationship between travel, tourism and hospitality industries. PO3: Develop leadership skills and to provide necessary Managerial, Communicative, IT, product and Resource skills to effectively handle Tourism activities.

Unit- I Introduction to E-tourism, Historical Development- Electronic technology for data processing and communication- Strategic, Tactical and operational use of IT in Tourism.

Unit - II Global Distribution System: History & Evolution - GDS & CRS - Levels of CRSParticipation - Hotel Distribution System - Cases of Amadeus - Galileo, World Span, Sabre, Abacus- Changing Business models of GDS.

Unit - III Typologies of E-tourism: Business models - Business to Business (B2B) - Business to Consumer (B2C) - Consumer to Business (C2B) - Consumer to consumer (C2C) - Business to Employees (B2E) - & Business to Government (B2G).

Unit- IV Payment Systems in E-tourism - Payment Gateway - Billing and Settlement Plan (BSP) - Security Issues and Certification - Future of E-tourism - Travel Blogs - E-marketing and promotion of Tourism Products - Challenges for conventional business models & Competitive strategies.

Unit - V Amadeus Practical - Hands on Amadeus Software - Searching - Building, Retrieval, Display & Cancel of PNR - Fare display - Itinerary pricing - Issuance of tickets.

EMPLOYABILITY

TEXTBOOKS

1. SheldonP.(2002),TourismInformationTechnology,CABI.
2. InkpenG.(2000),InformationtechnologyforTravelandTourism,AddisonWesley.

REFERENCES

1. BuhalisD.(2004),Etourism:InformationTechnologyforStrategicTourismManagement,PrenticeHallIndia.
2. PoonA.(1998),Tourism,TechnologyandCompetitiveStrategies,CABI.
3. RayportJ.F.&JaworskiB.J.(2002),IntroductiontoEcommerce,McGraw-Hill.
4. Malvino A.P(1995),ElectronicPrinciples,McGraw-Hill.

AGRIBUSINESS MANAGEMENT

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ33		3	0	0	3

SUBJECTTITLE:AGRIBUSINESSENVIRONMENTANDPOLICYOB

OBJECTIVE:

To expose learners to the environment in which the agri-business is conducted. Focus will be on understanding micro and macro environmental forces and their impact on agri-business.

COURSE OUTCOME

Understand the fundamentals of management with reference to agribusiness.
 Acquaint with various functional areas of agribusiness
 Study the managerial functions and its applications with reference to agribusiness
 Learn the concepts and process of Planning and Organizing
 Provides knowledge about the Staffing, Directing and Control

UNIT I Role of agriculture in Indian economy; problems and policy changes relating to farm supplies, farm production, agro processing, agricultural marketing, agricultural finance etc. in the country.

UNIT II Structure of Agriculture-Linkages among sub-sectors of the Agribusiness sector; economic reforms and Indian agriculture; impact of liberalization, privatization and globalization on Agribusiness sector.

UNIT III Emerging trends in production, processing, marketing and exports; policy controls and regulations relating to the industrial sector with specific reference to agro industries.

UNIT IV Agribusiness policies- concept and formulation; and new dimensions in Agri business environment and policy.

UNIT V Agricultural price and marketing policies; public distribution system and other policies.

Suggested Readings

Adhikary M. 1986. *Economic Environment of Business*. S. Chand & Sons. Aswathappa
 K. 1997. *Essentials of Business Environment*. Himalaya Publ. Francis Cherunilam
 2003. *Business Environment*. Himalaya Publ.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EJ34			3	0	0	3

SUBJECTTITLE:AGRICULTURALMARKETINGMANAGEMENTO

OBJECTIVE:

To expose learners to the environment in which the agri-business is conducted. Focus will be on understanding micro and macro environmental forces and their impact on agri-business. The objective of this course is to give the students an understanding of concept, various policies, strategies and decisions relating to marketing that can be developed by agribusiness firms.

UNIT I Meaning and scope, agricultural marketing and economic development; Agricultural market structure – meaning, components and dynamics of market structure; marketing strategy – meaning & significance, formulation of marketing strategy; agribusiness marketing environment, design of marketing mix, market segmentation and targeting, determinants of consumer's behaviour.

UNIT II Product management - product management process and decisions, new product development – significance and classification of new product, stages and estimation of demand of new product; product lifecycle.

UNIT III Pricing policies and practice for agribusiness - determinants of price, objectives of pricing policies and pricing methods.

UNIT IV Promotional management - advertising planning and execution; sales promotion; grading and standardization.

UNIT V Distribution management - storage and warehousing and transportation management for agricultural products; marketing agencies/intermediaries – roles and functions; distribution channels involved in agribusiness.

Suggested Readings

Acharya SS & Agarwal NL. 2004. *Agricultural Marketing in India*. 4th Ed. Oxford & IBH. Kohls RL & Uhj JN. 2005. *Marketing of Agricultural Products*. 9th Ed. Prentice Hall. Kotler P. 2002. *Marketing Management – Analysis, Planning, Implementation and Control*. Pearson Edu. Krishnamacharyulu C & Ramakrishan L. 2002. *Rural Marketing*. Pearson Edu. Ramaswamy VS & Nanakumari S. 2002. *Marketing Management*. 2nd Ed. MacMillan India.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ35		3	0	0	3

SUBJECT TITLE: FARM BUSINESS

MANAGEMENT OBJECTIVE:

To acquaint the students with the basic principles of farm management dealing with the analysis of farm resources having alternatives within the framework of resource restrictions.

COURSE OUTCOME

Understand the fundamentals of management with reference to agribusiness.

Acquaint with various functional areas of agribusiness

Study the managerial functions and its applications with reference to agribusiness

Learn the concepts and process of Planning and Organizing

UNIT I Nature, scope, characteristics and role of farm business management; farm management decisions; farm management problems.

UNIT II Principles of farm management decisions – principle of variable proportion, cost principle, principle of factor substitution, law of equi-marginal returns, opportunity cost principle, etc.

UNIT III Tools of farm management and farm business analysis - farm planning and budgeting; Farm records and accounts, types and problems in farm records and accounts, net worth statement, farm efficiency measures.

UNIT IV Management of farm resources – Land, Labour, Farm machinery, Farm building, etc.

UNIT V Risk and uncertainty in farming - sources of uncertainty in farming, management strategy to counteract uncertainty and decision making process in farm business management under risks and uncertainty.

Suggested Readings

Heady EO & Jensen H. 1960. *Farm Management Economics*. Prentice Hall.

Johl SS & Kapoor TR.

1973. *Fundamentals of Farm Business Management*. Kalyani Publ. Kahlon AS & Singh

K. 1992. *Economics of Farm Management in India*. Allied Publ.

Panda SC. 2007. *Farm Management & Agricultural Marketing*. Kalyani Publ.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EJ36			3	0	0	3

SUBJECTTITLE:MANAGEMENTOFAGRI BUSINESSCOOPERATIVES

OBJECTIVE:

Toacquaintthestudentwiththebasicprinciplesoffarmmanagementdealingwiththeanalysis offarmresourceshavingalternativeswithintheframeworkofresourcerestrictions.

COURSE OUTCOME

The Agri-Business Management assumes greater significance in the context of new economic regime & globalization of the Indian Agriculture & food industry. The Programme is structured so that core courses are taught and the field experience is provided enabling the students to understand and appreciate the various problems involved in Food and Agribusiness Management.

UNIT I Cooperative administration- a global perspective, ecology of cooperative administration,cooperative sectorandeconomic development.

UNIT II Cooperative management- nature, functions and purpose of cooperatives – procurement,storage, processing, marketing, process of cooperative formation, role of leadership in cooperativemanagement.

UNIT III The state and cooperative movement, effects of cooperative law in management, longrange planningforcooperative expansion,policymaking.

EMPLOYABILITY

UNIT IV Human resource management, placement and role of board of directors in cooperativemanagement.

UNIT V Overview of agribusiness cooperative– credit cooperatives, cooperative marketing,dairycooperative;financingagribusinesscooperative.

SuggestedReadings

AkmatJS.1978.*NewDimensionsofCooperativeManagement*. HimalayaPubl. House.AnsariAA.1990.*CooperativeManagementPatterns*.AnmolPubl. SahAK.1984.*Professional ManagementfortheCooperatives*.VikasPubl.House.

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ37		3	0	0	3

SUBJECTTITLE: FOODRETAILMANAGEMENT

Objective The objective of this course is to assist students in understanding the structure and working of food marketing system in India, to examine how the system affects farmers, consumers and middlemen and to illustrate the response of this dynamic marketing system to technological, socio-cultural, political and economic forces over time.

COURSE OUTCOME

Understand the functions of retail business and various retail formats and retail channels. Understand the difference between Retail and Manufacturing Supply Chain Understand, key drivers of retail supply chain and how to select a retail store location? Analyze Retail Market and Financial Strategy including product pricing. Integrate the various Supply Chain partners and how to collaborate with them.

UNIT I Introduction to International Food market, India's Competitive Position in World Food Trade, Foreign Investment in Global Food Industry, Retail management and Food Retailing, The Nature of Change in Retailing, Organized Retailing in India, E-tailing and Understanding food preference of Indian Consumer, Food consumption and Expenditure pattern, Demographic and Psychographic factors affecting Food Pattern of Indian Consumer.

UNIT II Value Chain in Food Retailing, Principal trends in food wholesaling and retailing, food wholesaling, food retailing, the changing nature of food stores, various retailing formats, competition and pricing in food retailing, market implications of new retail developments, value chain and value additions across the chain in food retail, food service marketing.

UNIT III 4 P's in Food Retail Management, Brand Management in Retailing, Merchandise pricing, Pricing Strategies used in conventional and non-conventional food retailing, Public distribution system, Promotion mix for food retailing, Management of sales promotion and Publicity, Advertisement Strategies for food retailers.

UNIT IV Managing Retail Operations, Managing Retailers' Finances, Merchandise buying and handling, Merchandise Pricing, Logistics, procurement of Food products and Handling Transportation of Food Products.

UNIT V Retail Sales Management Types of Retail Selling, Salesperson selection, Salesperson training, Evaluation and Monitoring, Customer Relationship Management, Managing Human Resources in retailing, Legal and Ethical issues in Retailing.

Suggested Readings

Berman & Evans. 2008. *Retail Management: A Strategic Approach*. 10th Ed. Prentice Hall of India.

Cox. 2006. *Retailing: An Introduction*. 5th Ed. Pearson Edu.

Levy M & Weitz B W. 2004. *Retailing Management*. 5th Ed. McGraw Hill

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ38		3	0	0	3

SUBJECTTITLE: MANAGEMENTOFAGRICULTURALINPUTMARKETING

Objective The objective of this course is to give the students an understanding of Different marketing concept and marketing system in context of agricultural inputs.

COURSE OUTCOME

- Understand and appreciate the structure and working of the agricultural marketing system in
- Learn how agriculture marketing system affects the farmers, consumers and intermediaries.
- Develop strategies through which the dynamic marketing system will respond to create a win-win situation for all the
- Appreciate the possible changes in the agriculture input, output and food market because of pandemic Covid 19 and need for the appropriate

UNIT I Agricultural input marketing – meaning and importance; Management of distribution channels for agricultural input marketing; Agricultural Inputs and their types – farm and non-farm, role of cooperative, public and private sectors in agricultural input marketing.

UNIT II Seed- Importance of seed input; Types of seeds- hybrid, high yielding and quality seeds; Demand and supply of seeds; Seed marketing channels, pricing, export/import of seeds; Role of NSC and State Seed Corporation.

UNIT III Chemical Fertilizers- Production, export-import, supply of chemical fertilizers, Demand/consumption, Prices and pricing policy; subsidy on fertilizers; marketing system – marketing channels, problems in distribution; Role of IFFCO and KRIBCO in fertilizer marketing.

UNIT IV Plant Protection Chemicals- Production, export/import, consumption, marketing system – marketing channels; Electricity/Diesel Oil- marketing and distribution system; pricing of electricity for agriculture use; subsidy on electricity.

UNIT V Farm Machinery- Production, supply, demand, Marketing and distribution channels of farm machines; Agro-industries Corporation and marketing of farm machines/implements/Equipments.

Suggested Readings

Acharya SS & Agarwal NL. 2004. *Agricultural Marketing in India*. 4th Ed. Oxford & IBH. Broadway AC & Broadway Arif A. 2003. *A Text Book of Agri-Business Management*. Kalyani. Singh AK & Pandey S. 2005. *Rural Marketing*. New Age. Singh Sukhpal 2004. *Rural Marketing-Focus on Agricultural Inputs*. Vikas Publ. House.

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2453

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ39		3	0	0	3

SUBJECTTITLE: AGRISUPPLYCHAINMANAGEMENT

Objective The course introduces students to the concepts and processes of agricultural supplychain management, framework for structuring supply chain drivers; network designs, demandforecasting,inventoryplanning,sourcing decisionsand ITenablementofsupplychain.

COURSE OUTCOME

Understand the fundamentals of elements and functions of supply chain, role of drivers and demand forecasting. To apply various techniques of inventory management and their practical situations. Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain. How various warehousing management system and transportation can be practiced in various industries

UNIT I Supply Chain: Changing Business Environment; SCM: Present Need; Conceptual Modelof Supply Chain Management; Evolution of SCM; SCM Approach; Traditional Agri. SupplyChainManagementApproach;ModernSupplyChainManagementApproach;Elements inSCM.

UNIT II Demand Managementin Supply Chain:Types of Demand,Demand Planning andForecasting;OperationsManagementinSupplyChain,BasicPrinciplesofManufacturingManagem ent.

UNITIIIProcurementManagementinAgri.Supplychain:PurchasingCycle,TypesofPurchases,Contr act/CorporateFarming,ClassificationofPurchasesGoodsorServices,Traditional Inventory Management, Material Requirements Planning, Just in Time (JIT), VendorManagedInventory(VMI).

UNIT IV Logistics Management: History and Evolution of Logistics; Elements of Logistics;Management;DistributionManagement,DistributionStrategies;PoolDistribution;Transpor tation Management; FleetManagement; ServiceInnovation; Warehousing; PackagingforLogistics,Third-PartyLogistics(TPL/3PL);GPSTechnology.

UNIT V Concept of Information Technology; IT Application in SCM; Advanced Planning

SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	20260EJ42			3	0	0	3

SUBJECT TITLE: AGRICULTURE ECONOMICS

Objective: Basic objective of this course is to impart knowledge about current Indian agriculture, policies and changes which have taken place in the post independence period with a special focus upon problems being faced in the light of challenges of food security and sustainable agriculture.

COURSE OUTCOME

Able to acquire knowledge and analytical skills in addressing the issues of agricultural marketing. Enhancing expertise in improving the performance of the marketing institutions and the players in marketing of agricultural commodities.

UNIT-I Role and importance of Agriculture in Economic Development, Features of Indian Agriculture, Causes of low productivity, Socio-cultural and Institutional constraints, Suggestive measures for improving Agricultural Productivity, Brief review of agricultural development under the Five year plans, Problems of Indian Agriculture

UNIT-II Land reforms: Meaning, Need and objectives, Measures contemplated to achieve the objectives of land reforms, Abolition of Intermediaries, Tenancy Reforms, Reorganisation of Agriculture, Rural Development Programmes and its impact on Rural Development and Agricultural development, MNREGA, Bharat Nirman

UNIT-III Agricultural Labour: Definition, causes of growth, conditions and problems, measures for improvement, Farm size and Efficiency, Food Security and Public Distribution System, Food Security System Act 2013

EMPLOYABILITY

UNIT-IV Modern Technology Vs Institutional Reforms. New agricultural technology and Farm Mechanisation, Choice of appropriate technology in agriculture. Green Revolution- concept, impact and scope, Agriculture and economic reforms.

UNIT-V: AGRICULTURE AND GLOBALIZATION International trade in agricultural commodities- Role of World Trade Organization; Issues in liberalization of domestic and international trade in agriculture- Impact of WTO on Indian agriculture

Suggested Reading:

1. Mishra and Puri: Indian Economy, (Latest Edition) Himalaya Publishing House, New Delhi
2. Raddar Dutt and K.P.M. Sundaram: Indian Economy, (Latest Edition) S. Chand & Co., New Delhi
3. Ministry of Finance, Govt. of India: Economic Survey, various issues
4. Economic and Political Weekly, Selected Articles
6. Ministry of Agriculture, Govt. of India, "Indian Agriculture at a Glance 2012"

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ43		3	0	0	3

SUBJECTTITLE:AGRICULTURALANDMICRO-FINANCE

Objective:Objective:TofamiliarizestudentswiththeAgriculturalFinancialSystem,MicrofinanceSystemandtoolsandtechniquesusedforbettermanagementdecisions.

COURSE OUTCOME

Understand the fundamentals of management with reference to agribusiness.
 Acquaint with various functional areas of agribusiness
 Study the managerial functions and its applications with reference to agribusiness
 Learn the concepts and process of Planning and Organizing
 Provides knowledge about the Staffing, Directing and Control.

UNIT-I Need and Importance of Agriculture Finance, Essential Features of Agriculture creditsystem, Agricultural credit Structure in India. Non-institutional financing for Agriculture, Meritsand Demerits. Management of Agri-Finance: View point of Borrower and lender. EconomicfeasibilityTestsofFarmcreditproposal(ThreeR'sofcredit&FourC'sofCredit).

UNIT-II Methods and mechanics of Lending to Agriculture, Role and functions of NABARD forAgriculture Finance Role of Commercial Bank and Agricultural Finance, Regional Rural BanksandRuralFinance,Its viability,Problems andchallenges

UNIT-III Multi-agency Approach to agricultural Finance, Problems of Over dues of Agriculturalloans.MeasuresstoovercometheProblemofoverdues.PublicFarmFinancingSchemes:Financing of Bio-Gas Plant, Financing of Poultry Development, Financing of Dairy Development,FinancingofCustomsServicesUnits,FinancingofMinorIrrigationSchemes

UNIT-

IVMicrofinance:ConceptandRevolution,Grameenexperiment.GrowthanddevelopmentofMicro-financeinBangladesh,Worldwithoutpoverty-ViewsofMuhammadYunus. Microfinance and SHGs in India and its importance for socio- economic development ofpoorfamilies.

UNIT-V Microfinance and women empowerment.Role of NABARDin linking SHGs withBanks,Growth andDevelopment.SGSYandSHGs.Roleof MFIs(Non-BankingFinancialInstitutions)in expandingmicro-creditfacilities for the poorest of poor in thecountry. TheseMFIs include SKS microfinance, SHARE, BASIX, etc. Some case studies on microfinance andAgriculture Finance.

SuggestedReadings:

1. S.S.M.Desai:Agriculture&RuralBankinginIndia,HPH
3. Pension:AgriculturalFinance, TataMcGrowHill
4. Bauman.IDieslam&EC:CapitalandCreditNeeds inChangingAgriculture,PHI
5. RaisAhmed:Micro- FinanceandWomenEmpowerment.MittalPub. NewDelhi
6. MalcolmHarper:PracticalMicro-Finance-ATrainingGuideforSouthAsia
7. K.G.Karmakar,Rural andSelfHelpGroupsMicrofinanceNeedsandconceptsIndia,SAGaPub.

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SEM	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		20260EJ44		3	0	0	3

SUBJECT TITLE: NEW TRENDS AND DEVELOPMENT IN AGRICULTURAL SECTOR

Objective: To familiarize students with the Agricultural Financial System, Microfinance System and tools and techniques used for better management decisions.

COURSE OUTCOME

Enable students to gain knowledge on agricultural marketing, challenges and prospects for improving agricultural marketing system. Gain skills to analyze Marketing Functions, Market Information and Intelligence. Imparting knowledge of the marketing efficiency and agricultural prices.

Learn the Markets and Market Structure. Provide the platform to the students of Marketing of Agricultural Inputs.

UNIT I Agribusiness Management

Concept of E-agribusiness, Need & importance of E-agribusiness, Different models in E-agribusiness, Microfinance with special reference to SHGs.

UNIT II Greenhouse/Polyhouse techniques

Basic concept of Green house / Polyhouse, Constructing Green House / Polyhouse, Different commercially important horticultural and other plants grown in Green House / Polyhouse, Importance & future scope of the technique.

UNIT III Plant Tissue culture Basic concept, scope & importance of plant tissue culture, Fundamental technique followed in tissue culture, Major crop plants exploited in tissue culture technique. **Biodiesel sector** Basic concept of biodiesel, Different crop plants used in biodiesel, Benefits of biodiesel in comparison to crude diesel / petrol, Manufacturing biodiesel, Algal biodiesel.

UNIT IV Managerial aspects in Food Processing Industry Organization of a food processing unit: Different department involved in a food processing company and importance of coordination in those departments etc. Importance of production, marketing & distribution aspects in food processing sector. **Management of Agro Processing Industry** Factors to be considered while establishing food processing plant including government norms & requirements, Actual processing of Agri-produce into final products, Utilization of byproducts in agro processing industry.

UNIT V Water Management:

Sources of water and water requirement of crops, irrigation water use efficiency. Micro-irrigation systems, economic use of water. Water conservation measures, rainwater harvesting, gully plugging, contour bunding, terracing, checking run-off water. Watershed development programmes, problems of water management, water pollution and strategies to overcome them. **Reference Books**

1. "Commercial Agri-enterprises - Strategy Achievement and Future prospects", S.N. Misra, Deep & Deep Publications, New Delhi.
2. Indian Agriculture & Agri-business management, Dr. Smita Diwse, Krishi Resource Management Network
3. B. Misra, G.C. Kar, S.N. Misra, 2004, "Agro Industries and Economic Development, A vision of the 21st Century", Deep & Deep Publications Pvt. Ltd., New Delhi
4. Dairy Technology, By Sukumar De, Tata MC Graw Hills Publication, New Delhi
5. Food biotechnology, S.N. Tripathy, Dominant Publishers and Distributors, New Delhi
6. Water Resources by Ministry of Agriculture, Govt. of India
7. Principles of Soil Conservation and Water Management by H.R. Arakeri and Roy D.



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THANJAVUR – 613 403 - TAMILNADU

SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

B.Sc CHEMISTRY CURRICULUM

REGULATION 2020

CO16		*		*		*
CO17	*		*		*	
CO18		*		*	*	
CO19	*	*		*		*
CO20			*	*	*	
CO21	*		*	*		*
CO22	*	*		*		*
CO23			*	*	*	
CO24	*	*	*		*	*
CO25	*	*		*		*
CO26	*	*		*	*	
CO27		*	*	*		
CO28	*	*			*	

B.Sc. CHEMISTRY SYLLABUS – REGULATION 2020



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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF CHEMISTRY
B.Sc CHEMISTRY – REGULATION 2020
COURSE STRUCTURE

SEMESTER – I						
COURSE CODE	COURSE TITLE	L	T	P	C	
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tamil – I/ Advanced English – I / Hindi – I/ French-I	4	0	0		2
20111AEC12	English – I	4	0	0		2
20114AEC13	General Chemistry - I	6	0	0		4
20114AEC14L	Volumetric Analysis Lab	0	0	3		2
20112AEC15A (OR) 20114AEC17	Calculus and Fourier Series	5	0	0		4
	General and Applied Botany –I	6	0	0		6

20112AEC16A (OR) 20114AEC18L	Algebra and Trigonometry	4	0	0	3
	General Botany Lab –I	0	0	3	2
2011INDCONS	Indian Constitution	0	0	0	0
2011LSCUV	Universal Human Values	-	-	-	2
	Total	29	0	06	19

SEMESTER - II

20110AEC21/ 20111AEC21/ 20131AEC21/ 20135AEC21	Tamil – II / Advanced English – I I / Hindi – II / French-II	4	0	0	2
20111AEC22	English – II	4	0	0	2
20114AEC23	General Chemistry - II	6	0	0	4
20114AEC24L	Organic Analysis Lab	0	0	3	2
20112AEC25A (OR) 20114AEC29A	ODE, PDE and Laplace Transform	5	0	0	4
	General and Applied Botany –II	6	0	0	6
20112AEC26A 20114AEC20L	Analytical Geometry in Vector Calculus	4	0	0	3
	General Botany Lab –II	0	0	3	2
20114RLC27	Research Led Seminar	-	-	-	1
20LSCCS	Communication Skills	-	-	-	2
201SSCBE	Basic Behavioral Etiquette	-	-	-	2
	Total	29	0	06	22

SEMESTER – III

20110AEC31/ 20111AEC31/ 20131AEC31/ 20135AEC31	Tamil – III / Advanced English – II I / Hindi – III / French-III	4	0	0	2
20111AEC32	English – III	4	0	0	2
20114AEC33	General Chemistry - III	5	0	0	4
20114AEC34L	Physical Chemistry Lab - I	0	0	3	2
20113AEC35	Physics - I	6	0	0	5
20113AEC36L	Physics Lab - I	0	0	3	2
20114RMC37	Research Methodology	2	0	0	2
201ACLSOAN	Office automation	-	-	-	2

	Total	21	0	06	21
SEMESTER - IV					
20110AEC41/ 20111AEC41/ 20131AEC41/ 20135AEC41	Tamil – IV / Advanced English – IV / Hindi – IV / French-IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20114AEC43	General Chemistry - IV	5	0	0	4
20114AEC44L	Physical Chemistry Lab - II	0	0	3	2
20113AEC45	Physics - II	6	0	0	5
20113AEC46L	Physics Lab - II	0	0	3	2
201ENVTSTU	Environmental Studies	2	-	-	2
201LSCLS	Leadership and Management Skills	-	-	-	2
201SSCAQ	General Aptitude and Quantitative Ability	-	-	-	2
	Total	21	0	06	23
SEMESTER - V					
20114AEC51	Inorganic Chemistry - I	5	0	0	4
20114AEC52	Organic Chemistry - I	4	1	0	3
20114AEC53	Physical Chemistry - I	4	1	0	4
20114AEC54L	Inorganic Qualitative Analysis Lab	0	0	3	2
20114AEC55L	Gravimetric Analysis Lab	0	0	3	2
20114DSC56_	Discipline Specific Elective -I	5	0	0	3
20114BRC57	Participation in Bounded Research	-	-	-	1
201_SEC05_	Skill Based Elective - V	-	-	-	2
	Total	18	02	06	21
SEMESTER - VI					

20114AEC61	Inorganic Chemistry - II	4	1	0	4
20114AEC62	Organic Chemistry - II	5	0	0	5
20114AEC63L	Industrial Chemistry Practical	0	0	3	2
20114AEC64L	Domestic Products Preparation - Practical	0	0	3	2
20114DSC65_	Discipline Specific Elective - II	5	0	0	3
201__OEC66_	Open Elective	4	0	0	2
20114PRW67	Project Work	0	0	0	4
201LSCCE	Community Engagement	-	-	-	1
201SSCIM	Interview Skills Training and Mock Test	-	-	-	2
20114PEE	Programme Exit Examination	0	0	0	1
	Total	18	01	06	26
Total Credits of the Program					132

DISCIPLINE SPECIFIC ELECTIVE COURSES - I

Semester	Elective No.	Course Code	Course Title
V	I	20114DSC56A	a) Pharmaceutical Chemistry
		20114DSC56B	b) Agricultural Chemistry

DISCIPLINE SPECIFIC ELECTIVE COURSES –II

Semester	Elective No.	Course Code	Course Title
VI	II	20114DSC66A	a) Polymer Chemistry
		20114DSC66B	b) Nano Science

OPEN ELECTIVE COURSES

Semester	Course code	Course Title
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VI	20110OEC	Tamil Ilakkiya Varalaru
	20111OEC	Journalism
	20112OEC	Development of Mathematical Skills
	20113OEC	Instrumentation
	20116OEC	Wildlife Conservation
	20120OEC	E-Learning
	20120OEC	Web Technology
	20161OEC	Banking Service

SKILL BASED ELECTIVE COURSES

Semester	Skill Based Elective	Course Code	Course Title
I	I	20120SEC01AL 20160SEC01B	a) Package Lab - I b) Effective Communication
II	II	20120SEC02AL 20160SEC02B	a) Package Lab - II b) Self Development
III	III	20120SEC03AL 20160SEC03B	a) Package Lab - III b) Interpersonal Relations and Social Responspilities
IV	IV	20120SEC04AL 20160SEC04B	a) Package Lab - IV b) Etiquette and Interviewing Skills
V	V	20120SEC05AL 20160SEC05B	a) Package Lab - V b) Leadership Skills and Body Language
VI	VI	20120SEC06AL 20160SEC06B	a) Package Lab - VI b) Life Skills and other Skills

RESEARCH BASED COURSES

Semester	Course Code	Course Title
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II	20114RLC27	Research Led Seminar
III	20114RMC37	Research Methodology
V	20114BRC57	Participation in Bounded Research

CREDIT DISTRIBUTION

SEMESTER	AEC	SEC	DSC	OEC	RESEARCH	OTHERS	TOTAL
I	20	03				01	23
II	20	03			01		23
III	18	03			03		24
IV	20	03				01	23
V	20	03	04		02		28
VI	14	03	04	02	05	02	31
TOTAL	108	18	8	2	11	03	152

SEMESTER – I

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC11	Tamil – I	4	0	0	2

தமிழ் -1

பாடத்திட்டம்

இளங்கலை: பருவம் 1 – பிரிவு –1 முதல் பருவம் - தாள் - 1

இக்கால இலக்கியம், செய்யுள், சிறுகதை, இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி

அலகு – 1

பாரதியார் தேசபக்திப் பாடல்கள் சுதந்திரப் பெருமை சுதந்திரப் பயிர் சுதந்திர தேவியின் துதி தொண்டு செய்யும் அடிமை பாரதிதாசன் வீரத்தாய்

அலகு – 2

சுரதா – நல்ல தீர்ப்பு கண்ணதாசன் - கந்தல் துணியின் கதை பட்டுக்கோட்டை கல்யாணசுந்தரம் - நண்டு செய்த தொண்டு – காலம் சரியில்லே மு.மேத்தா – வாழையடி வாழை வாலி – தாய்

அலகு – 3

சிறுகதை - இளவேனிற் குறிப்புகள் - திருவையாறு பாலகுமார்
அலகு - 4

இலக்கணம் எழுத்து மனப்பாடப்பகுதி

அலகு - 5

இலக்கிய வரலாறு சிறுகதை, புதினம், நாடகம், உரைநடை,
கவிதை,புதுக்கவிதை

தாள் - 1

ஒப்படைவு - மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை - 20 மதிப்பெண்

ஆத்திச்சூடி - 20 மதிப்பெண்

அறம் செய விரும்பு, ஆறுவது சினம், இயல்வது கரவேல், ஈவது
விலக்கேல், உடையது விளம்பேல், ஊக்கமது கைவிடேல், எண்
எழுத்து இகழேல், ஏற்பது இகழ்ச்சி, ஐயம் இட்டு உண், ஒப்புரவு
ஒழுக்கு, ஒதுவது ஒழியேல், ஒளவியம் பேசேல், கண்டு ஒன்று
சொல்லேல், ஞாயம்பட உரை, இடம்பட வீடு எடேல், இணக்கம்
அறிந்து இணங்கு, தந்தை தாய்ப்பேன், நன்றி
மறவேல், பருவத்தே பயிர்செய், இயல்பு அலாதன
செயேல், வஞ்சகம் பேசேல், இளமையில்
கல், அனந்தல் ஆடேல், கடிவது மற, கீழ்மை அகற்று, குணமது
கைவிடேல், கெடுப்பது ஒழி, கேள்வி முயல், சான்றோர் இனத்து
இரு, சோம்பித்திரியேல்.

(மேற்; கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை (மரபு
அல்லது புதுக்கவிதை) கதை, கட்டுரை, நாடகம் எழுதி வரச்
செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

To improve the knowledge of English

Objective:

To familiarize with the glossary terms, figures of speech

To improve vocabulary

To learn how to edit and proof read

To know the comparison and contrast and cause and effect forms

To understand the impact of the speeches of famous people

Outcome:

Develop vocabulary

Read and comprehend literature

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Essentials of Business Communication
& Sons

-Rajendra Pal &J.S Korlahalli Sultan Chand

English for writers and translators

-Robin Macpherson

Technical Communication

-Meenakshi Sharma & Sangeetha Sharma

The World's Great Speeches

- Sudhir Kumar Sharma Galaxy Publishers

English Work Book-I&II

-Jewelcy Jawahar

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

To acquaint students with learning English through literature

Objective:

To improve English delightfully through simple poems, essays

To throw light on fiction

To read and comprehend literature

Outcome:

Read and comprehend literature

UNIT –I

The Art of Reading

- Lin Yutang

An Eco-Feminist Vision

-Aruna Gnanadason

UNIT – II

The Merchant of Death

-Nanda Kishore Mishra & John

Kennet

She Spoke for all Nature

-Young world 'The Hindu'

UNIT –III

Because I could not Stop for Death

-Emily Dickinson

Stopping by Woods on a Snowy Evening

-Robert Frost

UNIT –IV

Enterprise

-Nissim Ezekiel

Love poem for a wife

-A.K Ramanujam

UNIT –V

Oliver Twist

-Charles Dickens

References:-

The Art of Reading/ Experiencing Poetry, S.Murugesan and Dr.K.Chellappan,
Emerald Publishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114AEC13	General Chemistry - I	6	1	0	5

Aim:

To study about the theoretical and molecular models of chemical compounds.

Objective:

To provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.

To expose the students to a breadth of experimental techniques using modern

instrumentation.

Outcome:

The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.

UNIT – I

Basic concepts in organic chemistry -Electron displacement effects – Inductive, electrometric and mesmeric effects, resonance, hyperconjugation and steric effects. Homolytic and heterolytic fission of carbon - carbon bonds. Reaction intermediates: - free radicals, carbocations, carbanions, carbenes, nitrenes and arynes - their stability.

UNIT II

Standard solution - primary and secondary standards solution, Types of titrimetric reactions - redox and precipitation titrimetric reactions. Indicators - effect of change in pH - neutralization – mixed and fluorescent indicators. Halogen family comparative study of halogens and their compounds- unique nature of fluorides and Oxides and oxyacids of halogens - preparation and properties

UNIT III

Nomenclature of organic compounds - IUPAC naming of simple and substituted Aliphatic, aromatic and alicyclic compounds_Alkanes : Mechanism of free radical substitution in alkanes. Petroleum-thermal and catalytic process of cracking Synthetic petrol - Fischer, Tropsch and Bergtius processes, flash point, fire point, smoke point, knocking, octane number

UNIT IV

Liquid State: Liquid crystals classification, structures Properties and applications. Colloidal State: Size of colloidal particles-gold number- peptisation, stability of colloids, coagulation and protection. Reverse Osmosis and desalination of sea water. Electrophoresis and endosmosis.

UNIT V

Solid state: Nature of the solid state - seven crystal systems - Bravais lattice unit cell, law of rational indices (Weiss indices), Miller indices, symmetry) elements in crystals (for cubic system)

X-Ray diffraction by crystals — derivation of Bragg's equation – Bragg method - Crystal structure of NaCl, KCl, ZnS, CsCl, determination of Avogadro number

References:

R.D. Madan, J.S.Tiwari and G.L.Mudhara, A Text book of First Year B.Sc.Chemistry, S.Chand&Co.

G.S.Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw Hill, New Delhi.

Paula Yaukanis Bruice- Organic Chemistry, Prentice Hall.

J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd, Oxford, 2002.

B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand and Co., New Delhi.

B.R.Puri and Sharma, Principles of Physical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC15A	Calculus and Fourier Series	4	0	0	4

Aim:

To equip the students with basic differentiation, integration and Fourier series.

Objectives:

This course is designed to give students, basic elementary calculus to allow them to tackle to solve Fourier series problems.

Outcomes:

By the end of this course, the student should solve the differentiation, integration and Fourier series.

Unit – I

Leibnitz theorem (Proof not needed) and its applications – curvature and radius of curvature in Cartesian only (Proof not needed) – total differential coefficient (Proof not needed) – Jacobians of two & three variables – Simple problems in all these.

Unit – II

Reduction formula (when n is a +ve integer) for (i)

$$\int_a^b e^{ax} x^n dx$$

$$\int_a^b \sin^n x dx$$

$$\int_a^x \cos^n x \, dx$$

$$\int_0^x e^{ax} x^n \, dx$$

$$\int_0^x \sin^n x \, dx$$

without proof $\int_0^x \sin^n x \cos^n x \, dx$ and illustrations

Unit – III

Beta and Gamma functions

Unit – IV

Evaluation of double and triple integrals in simple cases – changing the order and evaluating of the double integration (Cartesian only)

Unit – V

Definition of Fourier series – Finding fourier coefficients for a given periodic function with period 2π and with period $2l$ – use of odd and even functions in evaluating fourier coefficients – half range sine and cosine series.

Reference:

Calculus – T.K.M. Pillai

Trigonometry & Fourier series – T.K.M. Pillai.

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC16A	Algebra and Trigonometry	4	0	0	4

Aim:

To study Algebra and Trigonometry to solve various applications in chemistry.

Objectives:

This course is designed to give students, the student should know the algebra and trigonometry.

Outcomes:

By the end of this course, the student should solve the algebra and Trigonometry concepts to solve the problems.

Unit – I

Binomial, Exponential & Logarithmic series (Formulae only) – Summation

Unit – II

Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices – Characteristics equation, eigen values, eigen vector – Cayley

Hamilton's theorem (proof not needed) Simple application only.

Unit – III

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ (n being a positive integer) – Expansion of $\sin^n \theta$, $\cos^n \theta$, $\sin^n \theta \cos^m \theta$ in a series of sines and cosines of multiples of θ (θ – given in radius) Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of powers of θ (only problems in all the above)

Unit – IV

Euler's formula for $e^{i\theta}$ – definition of hyperbolic functions – formulae involving hyperbolic functions – relation between hyperbolic and circular function – expansion of $\sinh x$, $\cosh x$, $\tanh x$ in power of x.

Unit – V

Expansion of inverse hyperbolic function – $\sinh^{-1} x$, $\cosh^{-1} x$ and $\tanh^{-1} x$ - Separation of real and imaginary parts of $\sin(x+iy)$, $\cos(x+iy)$, $\tan(x+iy)$, $\sinh(x+iy)$, $\cosh(x+iy)$, $\tanh(x+iy)$

References:

1. T.K.M. Pillai, T.Natarajan, K.S. Ganapathi, Algebra, Vol I. S.Viswanathan Pvt.Ltd., Chennai – 2004
2. S.Narayanan, T.K.M.Pillai, S.Viswanathan Pvt.Ltd. & Vijay Nicole imprint Pvt. Ltd. 2004.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC14L	Volumetric Analysis Lab	0	0	3	2

Strong acid vs strong base.
 Weak acid vs strong base.
 Estimation of ferrous sulphate.
 Estimation of oxalic acid.
 Estimation of copper.
 Estimation of potassium dichromate.
 Estimation of potassium permanganate.
 Estimation of Ca by EDTA.

Employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
201INDCONS	Indian Constitution	1	0	0	1

Objectives:

1. To make the students understand about the democratic rule and parliamentary administration
2. To appreciate the salient features of the Indian constitution
3. To know the fundamental rights and constitutional remedies
4. To make familiar with powers and positions of the union executive ,union parliament and the supreme court .
5. To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Learning Out comes:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights are established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies - fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court - high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India.
State council of ministers -chief minister -election system in India-main features
election commission-features of Indian democracy.

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 2055.
- 3) Markandan. k.c.directive Principles in the Indian constitution 2066.
- 4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 2089

SEMESTER – II

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC21	Tamil – II	4	0	0	2

தமிழ் பாடத்திட்டம் இளங்கலை : பருவம் -2

தாள் - 2

செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறு.மனப்பாடப்பகுதி

அலகு-1

திருஞானசம்பந்தர் தேவாரம் -இடரினும் தளரினும் – பதிகம்
திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை –
பதிகம் திருவாசகம் - கோயிற் திருப்பதிகம்

திருமந்திரம் - 25, 85, 139,238,250,252,270,724,2104,2716 திருஅருட்பா –
தெய்வமணி மாலை 1,8,9

அலகு-2

நம்மாழ்வார் - 1 பாசுரம்- திருவாய்மொழி –எம்பெருமானுக்கு
ஆட்படுதல் இன்பமே

பெரியாழ்வார் - 1 பாசுரம் - திருப்பல்லாண்டு – தாலப்பருவம்
நாச்சியார் திருமொழி -10 பாடல்கள்- ஆறாம் திருமொழி

அலகு-3

சிற்றிலக்கியம் , முக்கூடற்பள்ளு- வளமை, செழுமை மதுரை
மீனாட்சியம்மை பிள்ளைத்தமிழ்- தாலப்பருவம்-
ஐந்துபாடல்கள்

அலகு-4

இலக்கணம் சொல் மனப்பாடப்பகுதி

அலகு-5

இலக்கிய வரலாறு சைவ, வைணவ இலக்கியங்கள்
சிற்றிலக்கியம்.பள்ளு பிள்ளைத்தமிழ் பரணி
தாள் -2

ஒப்படைவு – மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண்

கொன்றை வேந்தன் 20 மதிப்பெண்

அன்னையும் பிதாவும் முன்னறி தெய்வம், இல்லறம் அல்லது
நல்லறம் அன்று, ஊருடன் பகைக்கின் வேருடன் கெடும், ஏவா
மக்கள் மூவா மருந்து, ஔவியம் பேசுதல் ஆக்கத்திற்கு அழிவு,
அஃகமும் காசும் சிக்கனத்தோடு, கற்பெனப்படுவது
சொல்திறம்பாமை, கிட்டாதாயின் வெட்டென மற, கீழோர்
ஆயினும் தாழ் உரை, குற்றம் பார்க்கின் சுற்றம் இல்லை, கூர்
அம்பு ஆயினும் வீரீயம் பேசேல், கெடுவது செய்யின் விடுவது
கருமம், கைப்பொருள் தன்னின், மெய்ப்பொருள்
கல்வி, சீரைத்தேடி ஏரைத்தேடு, சுற்றத்திற்கு அழகு சூழ
இருத்தல், சூதும் வாதும் வேதனை செய்யும், சேமம்புகினும்
யாமத்து உறங்கு, சோம்பர் என்பவர் தேம்பித்திரிவர், தந்தை
சொல்மிக்க மந்திரம் இல்லை, தாயிற் சிறந்தது ஒரு கோவிலும்
இல்லை, திரைகடல் ஓடியும் திரவியம் தேடு, தீராக் கோபம்
போராய் முடியும், தோழனோடும் ஏழமை பேசேல், நாடெங்கும்
வாழக் கேடொன்றும் இல்லை, நீரகம் பொருந்திய ஊரகத்து இரு,
பாலோடு ஆயினும் காலம் அறிந்து உண், பையச் சென்றால்
வையம் தாங்கும், மருந்தே ஆயினும் விருந்தோடு உண்,
முற்பகல் செய்யின் பிற்பகல் விளையும், மேழிச் செல்வம்
கோழைபடாது.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு
அல்லது புதுக்கவிதை) கதை, கட்டுரை, நாடகம் எழுதி வரச்
செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

To improve the knowledge of English

Objective:

To understand the format of e-mail, fax and memos

To write itinerary, checklist, invitation, circular, instruction, recommendations

To understand the impact of the biographies of famous people

Outcome:

Develop writing skill

Read and comprehend literature

UNIT – I

E-mail, Fax, Memos

UNIT – II

Itinerary, Checklist

UNIT – III

Invitation, Circular

UNIT – IV

Instruction, Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma & Sangeetha Sharma

Inspiring Lives

-Maruthi Publishers

English Work Book-I&II

-Jewelcy Jawahar

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

To acquaint learners with different trends of writing

Objective:

To empower students to acquire language skills through literature

To enable the students to appreciate literature

To develop the conversational skills through one act plays

Outcome:

Read and comprehend literature.

UNIT – I

Ecology

-A.K. Ramanujan

Gift

-Alice Walker

The First Meeting

-Sujata Bhatt

UNIT –II

Fueled

-Marcie Hans

Asleep

-Ernst Jandl

Buying and selling

-Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee

-K.A. Abbas

I Have a Dream

-Martin Luther king

Those People Next Door

-A.G. Gardiner

UNIT – V

Marriage is a private Affair

-Chinua Achebe

The Fortune Teller

-Karel Capek

Proposal

-Anton Chekov

References:-

Gathered Wisdom

-GowriSivaraman EmeraldPublishers

<u>COURSE</u> <u>CODE</u>	<u>COURSE TITLE</u>	<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
20114SEC23	General Chemistry -II	6	1	0	5

Aim:

Develop an appreciation of chemistry and its application in daily life.

Objective:

To teach students to analyze data from experiments or from other sources.

To acquire students a readiness in becoming responsible citizens in a changing world.

Outcome:

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

UNIT I

Alkynes: Acidity of acetylene, formation of acetylides, addition of water with HgSO₄ catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydroboration (mechanisms).

Cycloalkanes: Preparation using Wurtz's reaction, Dieckmann's ring closure and reductions of aromatic hydrocarbons. Substitution and ring opening reactions. Baeyer's strain theory and theory of stainless rings.

UNIT II

Quantum numbers - principal, Azimuthal, magnetic and spin quantum numbers and their significance - Pauli exclusion principle - Hund's rule - Aufbau principle, (n+1) rule, stability of half-filled and fully filled orbitals - inert pair effect.

UNIT III

Quantum theory: Bohr's model of atoms. Bohr's theory of hydrogen and spectral lines. Limitations of Bohr model. Sommerfeld's extinction. Photoelectric effect and Compton Effect. Debroglie's equation and verification (Davisson and Germer expt)

UNIT IV

Chemical Kinetics: Rate of reactions, rate laws, rate constant, order and molecularity of reactions. Rate equations for zero, first, second and third order reactions. Derivation of rate constant for Zero, first and second order reactions. Fractional

order reactions. Examples- Half-life period, Pseudo first order reactions.

UNIT V

Polymerization: Types- free radical, cationic and anionic polymerizations with mechanisms.

Preparation of polymers - addition polymers (PE, PVC, Teflon and PS)-Condensation polymers (Nylon6.6, tereylene) - synthetic rubbers (Buna, Butyl rubber, SBR, neoprene) - natural rubber.

References:

S.S.Dara — A Text Book of Environmental Chemistry and Pollution Control- S.Chand and Co.

D.N.Bajpai — Advanced Physical Chemistry — S.Chand and Co.

Bruce H.Mahan, University Chemistry, Narosa Publishers, New Delhi, 2089.

R.T.Morrison and R.N.Boyd, Organic Chemistry, 6th Edition.

I.L.Finar Organic Chemistry , Volume I

R.D.Madan, Advanced Inorganic Chemistry.

Puri and Sharma, Text Book of Physical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC24L	Organic Analysis Lab	0	0	3	2

A study of the reactions of the following organic compounds,:

Carbohydrate,

Amide,

Aldehyde,

Ketone,

Acid,

Phenol.

The students may be trained to perform the specific reactions like tests for elements (nitrogen only) aliphatic or aromatic saturated or unsaturated and functional group present and record their observations.

Preparation (Single stage) involving

Nitration,

Hydrolysis

Bromination.

Employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC25A	ODE, PDE and Laplace Transform	4	0	0	4

Aim:

To study the Ordinary Differential Equations, Partial Differential Equations and Laplace Trans for my to solve mathematical applications in chemistry.

Objectives:

This course is designed to give students, the student should know the Differential Equations and Laplace Transform.

Outcomes:

By the end of this course, the student should solve the ODE, PDE and LAPLACE TRANSFORM concepts to solve the problems.

UNIT I:

Ordinary differential equations of first order but of higher degree- Equations solvable for x and y – solvable for dy/dx, clairaut's form (simple case only)- homogeneous linear differential equation(Variable coefficients), variation of parameter.

UNIT II:

Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions- definition of general, particular and complete solution – singular integral(Geometrical meaning not required) solution of first order equations in the slandered forms $f(p,q)=0$, $f(x,p,q)=0$, $f(z,p,q)=0$ $f_1(x,p)=f_2(y,p)$ $z=(x,p+yq=f(p,q)$.

UNIT III:

Lagrange's method for solving $Pp + Qq = R$ where p,q,r functions of X, Y, Z- (geometrical meaning is not needed)- (only problem in all the above- No proof needed for any formula) Cherpit's method The four standard forms.

UNIT IV:

Laplace Trnsforms- Definitions-

$L(eat)$ $L(\cos at)$, $L(\sin at)$, $L(t^n)$ where n is a positive integer – Basic theorem inlaplace (transform only) $L(e^{-st} \cos bt)$, $L(e^{-st} \sin bt)$, $L[e^{-st} f(t)]-L[F(t)$, $L[f(t)]$, $L[f'(t)]$

UNIT V:

Inverse Laplace transform related to the above standard forms- solving second order ODE with constant coefficients using laplace transforms and simultaneous equation, variable coeffieicients. Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions, change of interval — Half range series.

References:

1. S. Narayanan – differential equations
2. T.K.M Pillai & S.Narayanan- calculus
3. M.L.Khanna- differential calculus

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC26A	Analytical Geometry in Vector Calculus	4	0	0	4

Aim:

To study analytical geometry in vector calculus for the application in Chemistry.

Objectives:

This course is designed to give students; the student should know and solve the analytical geometry in vector calculus.

Outcomes:

By the end of this course, the student should solve problems of analytical Geometry in vector calculus.

UNIT – I

Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative - Unit normal vector- tangent plane

Unit- II

Divergence- Curl – Solenoidal & Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.

Unit –III

Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential- work done by d Force- Surface integrals – Volume integrals.

Unit –IV

Gauss divergence theorem , Stoke's theorem (statement, application & verification only)

Unit –V

Equation of sphere – Tangent plane – plane section of a sphere – Finding the centre & radius of the circle of integration – sphere through the circle of integration (only problem in all above)

Reference:

T.K. Manickavasagam Pillai, Analytical Geometry (3D) & Vector calculus, Neq Gamma Publishing House, 2091

SEMESTER – III

COURSE CODE	COURSE TITLE	L	T	P	C

தமிழ்

பாடத்திட்டம்

இளங்கலை : பருவம் மூன்று-

தாள் - 3 செய்யுள் - காப்பியங்கள், இலக்கணம்,இலக்கிய வரலாறு, மனப்பாடப்பகுதி

அலகு-1

சிலப்பதிகாரம்-வழக்குரை காதை மணிமேகலை-ஆதிரை பிச்சையிட்ட காதை சீவகசிந்தாமணி-நாட்டுவளம் 10 பாடல்கள்

அலகு-2

பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம் கம்பராமாயணம்-வாலி வதைப்படலம்

அலகு-3

சீறாப்புராணம் - கரம் பொருத்து படலம் இயேசுகாவியம் - மழைப்பொழிவு

அலகு-4

இலக்கணம் யாப்பு மனப்பாடப்பகுதி

அலகு-5

இலக்கிய வரலாறு காப்பியங்கள் ஐஞ்சிறுகாப்பியங்கள் புராணங்கள், இதிகாசங்கள்

தாள் - 3

ஒப்படைவு – மதிப்பெண் 40

பாடத்தொடர்புடையக் கட்டுரை 20 மதிப்பெண்

வெற்றி வேற்கை 20 மதிப்பெண்

எழுத்து அறிவித்தவன் இறைவன் ஆகும், கவ்விக்கு அழகு கசடற மொழிதல், செல்வர்க்கு அழகு செழுங்கிளை தாங்குதல், மன்னவர்க்கு அழகு செங்கோல் முறைமை, வைசியர்க்கு அழகு வளர் பொருள் ஈட்டல், உழவர்க்கு அழகு உழுது ஊண் விரும்பல், மந்திரிக்கு அழகு வரும் பொருள் உரைத்தல், தந்திரிக்கு அழகு தறுகண் ஆண்மை, உண்டிக்கு அழகு விருந்தோடு உண்டல், பெண்டிர்க்கு அழகு எதிர் பேசாதிருத்தல், அறிஞர்க்கு அழகு கற்றுணர்ந்து அடங்கல், வறிஞர்க்கு அழகு வறுமையில் செம்மை, பெரியோர் எல்லாம் பெரியோரும் அல்லர். சிறியோர் எல்லாம் சிறியரும் அல்லர், அடினும் ஆவின் பால் தன் சுவை குன்றாது, சுடினும் செம்பொன் தன்னொளி கெடாது, அறைக்கினும் சந்தனம் தன் மனம் மாறாது பெருமையும் சிறுமையும் தான் தர வருமே, அறிவுடை ஒருவனை அரசும் விரும்பு, யானைக்கு இல்லை தானமும், தருமமும், பூனைக்கு

இல்லை தவமும் தயையும், ஞானிக்கு இல்லை இன்பமும் துன்பமும் , அச்சமும் நாணமும் அறிவிலோருக்கு இல்லை, நாணம் கிழமையும் நலிந்தோருக்கு இல்லை, கேளும் கிளையும் கெட்டோருக்கு இல்லை, உடைமையும் வறுமையும் ஒரு வழி நில்லா, இரந்தோர்க்கு ஈவதும் உடையோர் கடனே, பழியா வருவது மொழியாது ஒழிவது, சுழியா வருபுனல் இழியாது ஒழிவது, துணையோடு அல்லது நெடுவழி போகேல்.

(மேற்;கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

To improve the knowledge of English

Objective:

To familiarize with the organs of speech and the description and classification of speech sounds

To understand consonant cluster, syllable, word accent and intonation.

To know how to interpret graphics

To write slogans and advertisements

Outcome:

Understand Phonetics

Develop writing skill

UNIT –I

The organs of speech, Classification of speech sounds , Vowels and Diphthongs

UNIT –II

Consonants, Consonant cluster

UNIT – III

Syllable, Word accent, Intonation

UNIT – IV

Idiom, Interpretation of graphics

UNIT – V

Slogan writing, Writing advertisement

References:

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
A text book of Phonetics for Indian Students	-T.B. Balasubramaniyan

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

To acquaint students with learning English through literature

Objective:

To sensitize students to language use through prescribed text

To develop the conversational skills through one act plays

Outcome:

Read and comprehend literature

UNIT – 1

The Doctor's World	-	R.K. Narayan
The Postmaster	-	Rabindranath Tagore
Princess September	-	E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	-	Norah Burke
Uneasy Home	Coming	- Will F. Jenkins
Resignation	-	Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

References:-

Nine Short Stories	-Steuart H.King	Blackie Books
One-Act plays of Today	-T.Prabhakar	Emerald Publishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC33	General Chemistry - III	5	0	0	5

Aim:

To acquaint with the knowledge of nature of metals and its characters.

Objective:

The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.

The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

Outcome:

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

UNIT I

Alkali and alkaline earth metals:

Comparative study of alkali and alkaline metal compounds (oxides, halides, hydroxides, carbonates, sulphates). Diagonal relationship between lithium and magnesium, lithium aluminium hydride and sodium borohydride — preparation, properties and uses. Coinage metals: Comparative study of coinage metals. Zinc Group metals: Comparative study of Zinc group metals. Galvanization, existence of mercurous ion and Hg^{2+} principles of qualitative analysis -solubility product, principles of elimination of interfering radicals, common effect, reactions including spot tests in qualitative analysis.

UNIT II

Inner transition elements:

Lanthanides—occurrence—electronic configuration — oxidation states, magnetic properties, complexation behaviour. Actinides —occurrence — electronic configuration — oxidation states, magnetic properties and complexation behavior. Lanthanide contraction. Chemistry of thorium and uranium — occurrence, extraction and uses. Mineral wealth of India —minerals found in India. Steel and alloy steels — Heat treatment of steel.

UNIT III

Aromatic hydrocarbons and Aromaticity:

Structure and stability of benzene ring — resonance in benzene — delocalized π electron cloud in benzene. Aromaticity — Huckel's Rule — examples — benzene, naphthalene, anthracene, furan, pyrrole, thiophene and ferrocene. Electrophilic substitution reactions in aromatic compounds. General mechanism of electrophilic

substitution reactions — Nitration, sulphonation , halogenation, Friedel-Crafts alkylation and acylation reactions — nuclear and side chain halogenations.

UNIT IV

Polynuclear hydrocarbons-

Napthalene and anthracene — isolation, properties, structure and uses. Aromatic nucleophilic substitution — Benzyne mechanism and intermediate complex formation mechanism — effect of substituents on reactivity.

UNIT V

Magnetic properties of matter- magnetic flux- magnetic permeability —magnetic susceptibility. diamagnetism, paramagnetism, ferro and anti-ferro magnetism — Curie temperature. Determination of magnetic susceptibility —Buoy's method — number of unpaired electrons. Application to structural problems $K_3Fe(CN)_6$, $K_4Fe(CN)_6$ and $Ni(CO)_4$.

References:

P.L.Soni & Mohankatyal, Text Book of Inorganic Chemistry 20th Revised edn., Sultan Chand 2092.

R.B.Puri & L.R.Sharma, "Principles of Inorganic Chemistry," Sultan Chand, 2089.

P.L.Soni & H.M.Chawla "Text book of Organic Chemistry' Sultan Chand & Sons 2094, Delhi.

K.S.Tewari, S.N.Mehrotra and N.K.Vishnoi, "A Text book of Organic Chemistry". M.K.JAIN," Organic Chemistry", Shoban Lal Nagin Chand and Co.

B.R.Puri,L.R.Sharma and Madan S.Pathania, "Principles of Physical Chemistry" Shoban Lal Nagin Chand and Co., Delhi.

Vogel's "Text Book of Quantitative Chemical Analysis" E.L.B.S.

R.D.Madan, "Modern Inorganic Chemistry". 2087, S.Chand & Company Ltd.

P.L.Soni,"Text book of Organic Chemistry, Sultan Chand & Co., New Delhi.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC34L	Physical Chemistry Lab - I	0	0	3	3

Kinetics – Acid hydrolysis of Ester – (Methyl acetate)

– (IN HCL & 0.5N HCL)

Kinetics – Acid hydrolysis of Ester – (Ethyl acetate))

2490(IN HCL & 0.5N HCL)

Determination of molecular weight of substance by Rast method
 Determination of (CST) of phenol – water system
 Effect of impurities on CST
 Determination of molecular weight of substances by Transition
 Temperature method.

Employability/Entrepreneurship/Skill development.

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC35	Physics - I	5	0	0	4

Aim:

The course presents an introduction to the physics of the objects whose sizes span from atomic dimensions to macroscopic, human scale dimensions, and beyond: atoms, molecules, gases, liquids, and solids.

The aim is to show how the properties of macroscopic bodies can be derived from the knowledge that matter is made up from atoms.

Objectives:

Recognize the difference between physical and chemical properties

Distinguish between extensive and intensive properties

Outcomes:

On completion successful students will be able to demonstrate an understanding of:

1. The relationships between physics on the atomic scale and the properties of matter.
2. The roles played by microscopic states of system, their numbers and their accessibility.
3. Techniques for finding appropriate averages to predict macroscopic behavior.

Unit I: Mechanics

Center of gravity of a solid hemisphere – Hollow hemisphere – Solid cone. Stability of floating bodies – Meta center – Determination of Meta centric height of a ship.

Unit II: Sound

Simple harmonic motion – comparison of two simple harmonic motion – A long straight line – At right angle to each other Lissa Hou's figures and their application – Acoustics of buildings reverberation – reverberation time Sabine's formula – conditions for good acoustics.

Decibel – phon – Intensity measurements by hotwire microphone method.

Unit III: Properties of matter

Diffusion: Fick's law – Coefficients of diffusion – experimental determination of coefficient of diffusion – application.

Osmosis: Laws of osmotic pressure Berkelly and Hartly method of determining osmotic pressure – elimination of boiling and depression of freezing point – application.

Unit IV

Thermal Physics: Newton's law of cooling – Verification – specific heat capacity of liquid by cooling – bomb calorie meter.

Conduction: Coefficeint of thermal conductivity – good and bad conductor – Stefan's law of radiation - Solar constant – Angstorm's phyro heliometers – temperature of the sun.

Unit V

Optics: Electro magnetic spectrum – spectral response of human eye – UV and IR spectroscopy

Raman effect – experimental arrangement – application of Raman effect.

Fiber optic communication: Introduction – optic fiber – numerical aperture – coherent bundle – fiber optic communication system and its advantage – multimode optic sensors.

Reference:

Sound , Saigal, S-Chand & co.

Properties of matter, D.S.Matur.

Heat and Thermodynamics, Brijal Subramaniyam.

Optics, Brijal Subramaniyam.

Static, Hydrostatics and Hydrodynamics, Nrayanamoorthy & Nagarathinam.

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC36L	Physics Lab - I	0	0	3	3

List of Experiments

Semi-conductor diode characteristics

Surface tension – Drop weight method

Meter Bridge – Determinations of resistance

Post office Box – Resistance
 Non-uniform Bending – Young’s modulus
 Potentiometer – Voltmeter calibration
 Sonometer – Verification of laws
 Spectrometer – Determinations of refractive index
 Bridge Rectifier
 Basic Logic Gates – Discrete components

COURSE CODE	COURSE TITLE	L	T	P	C
20114RMC37	Research Methodology	3	0	0	3

AIM:

To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

To understand the steps in research process and the suitable methods.

To identify various research communications and their salient features

To carry out basic literature survey using the common data-bases

To give exposure to standard laboratory precautions and best practices for experimental work

To provide orientation for basic mathematical computation useful in basic research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

PREREQUISITES:

Basic mathematical and experimental skills and exposure to window-based computer operation system.

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents –

Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V: Laboratory Safety

General guidelines. Hygiene – Eye, foot, skin and hand protection – Safety rules
Equipment protection – Respiratory protective equipment – safety equipment –
Leaking
compressed gas cylinders – electrical safety. Fire – fire extinguishers.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 2099.
3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.

COURSE CODE	COURSE TITLE	L	T	P	C
20120SEC03AL	Packages Lab-III	0	0	2	1

Packages Lab-III (Power Point)

Create a slide show presentation for a seminar (choose your own topics)

Enter the text in the outline view

Create Non-bulleted and bulleted text

Create a slide show presentation for a science exhibition

Create Non-bulleted and bulleted text

Apply appropriate text attributes

Create slide show presentation for an invitation

Insert an object from a bitmap file

Apply appropriate text attributes

Rotate the object to 45 degree

Apply shadow to the object
 Create a slide show presentation to display percentage of marks in each semester for all students
 Use bar chart (x-axis: semester; y-axis: % of marks)
 Use different presentation template and different transition effect for each slide
 Use different text attributes in each slide
 Create a slide show presentation for a shop advertisement to be open shortly
 Create a slide show presentation to display percentage of sales in each quarter for the any vendor using bar chart (x-axis: Quarter; y-axis: % of sales)
 Create a slide show presentation for a tourists places
 Create a slide for calendar using appropriate text attributes and insert an object from a bitmap file

COURSE CODE	COURSE TITLE	L	T	P	C
20111SEC03L	Communicative English-III	0	0	2	1

Aim:

To acquaint with the basic grammar

Objective:

To familiarize with the clauses and phrases

To learn the different degrees of comparison

To change a sentence from active to passive and vice versa

To know where to use punctuations

To frame sentences

To know the features, process, forms and barriers of communication

Outcome:

Understand grammar

UNIT –1

Clauses

Phrases

UNIT –II

Degrees of comparison

UNIT –III

Active and Passive

UNIT –IV

Communication

Characteristics -Process -Forms - Barriers

UNIT –V

Punctuation

Forming sentences

References:-

A Practical English Grammar

-A.J Thomson and A.V. Martinet

English Grammar

- Wren and Martin

Technical Communication
Sharma

-Meenakshi Sharma & Sangeetha

SEMESTER – IV

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

பாடத்திட்டம்

இளங்கலை : பருவம் -4

தாள் - 4

செய்யுள்- சங்க இலக்கியம், இலக்கணம்,இலக்கிய வரலாறு-
மனப்பாடப் பகுதி

அலகு-1

எட்டுத்தொகை நற்றினை – குறிஞ்சி 356,முல்லை-242, பாலை-397
குறுந்தொகை-2,18,25,58,67,69,135,167,283,373 ஐங்குறுநூறு-
சிறுவெண் காக்கைப் பத்து

அலகு-2

கலித்தொகை-பாலை 34,குறிஞ்சி-51,நெய்தல்-133 அகநானூறு -
36,147,332

புறநானூறு- 34,203,189,235,279

அலகு-3

முல்லைப்பாட்டு திருக்குறள்-ஐந்து அதிகாரம்- அறம் 2,பொருள்
2,இன்பம் -1
வான்சிறப்பு,அழுக்காறாமை,இறைமாட்சி,கூடாநட்பு,காதற்சி
றப்புரைத்தல்

அலகு-4

இலக்கணம் அணி மனப்பாடப்பகுதி

அலகு-5

இலக்கிய வரலாறு எட்டுத்தொகை பத்துப்பாட்டு
அறஇலக்கியங்கள்

ஒப்படைவு மதிப்பெண்-40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண் பாரதியார்,
பாரதிதாசன் புதிய ஆத்திச்சூடி 20 மதிப்பெண்

பாரதியார்

அச்சம் தவிர்,ஆண்மை தவறேல்,இளைத்தல் இகழ்ச்சி,உடலினை
உறுதி செய்,எண்ணுவது உயர்வு,ஏறுபோல் நட,ஐம்பொறி ஆட்சி
கொள்,ஒற்றுமை வலிமையாம்,காலம் அழியேல்,கீழோருக்கு
அஞ்சேல்,குன்றென நிமிர்ந்து நில்,கொடுமையை எதிர்த்து நில்,
சிதையா நெஞ்சு கொள்,செய்வது துணிந்து செய், தீயோருக்கு
அஞ்சேல்,பெரிதினும் பெரிது கேள்,வையத்தலைமை
கொள்,யாரையும் மதித்து வாழ்

பாரதிதாசன்

காற்றினைத் தூய்மை செய்,குற்ற நினைவு தீர்,தளையினைக்
களைந்து வாழ் தூய நீராடு, தெருவெல்லாம் மரம் வளர்,தைக்க
இனிதுரை,தொன்மை மாற்று,நிவினில் தெளிவு கொள்,
நீனிலம் உன் இல்லம்,போர்த் தொழில் பழகு,மாறுவது
இயற்கை, வையம் வாழ வாழ்.

(மேற்;கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு
அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச்
செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

References:

- | | |
|--|--------------------------------------|
| English Grammar | -Wren and Martin |
| English Grammar and Composition | -Radhakrishna Pillai |
| Essentials of Business Communication
Chand & Sons | -Rajendra Pal &J.S Korlahalli Sultan |
| Technical Communication
Sharma | -Meenakshi Sharma & Sangeetha |
| English for writers and translators | -Robin Macpherson |
| English Work Book-I&II | -Jewelcy Jawahar |

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

To acquaint students with learning English through literature

Objective:

To introduce learners to the standard literary texts

To impart wisdom through morally sound poems and essays

To introduce Shakespeare to non-literature students

Outcome:

Read and comprehend literature

UNIT –I

How to be a Doctor -Stephen Leacock

My Visions for India -A.P.J. Abdul Kalam

Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning

The Toys -Coventry Patmore

I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin

The Verger -W.S Maugham

A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth, As You Like It

UNIT –V

Henry IV, Tempest

References:-

English for Enrichment

-.Devaraj Emerald Publishers

Selected Scenes from Shakespeare Book I &II

-EmeraldPublishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC43	General Chemistry - IV	6	0	0	6

Aim:

2499

To acquaint with the knowledge of nature of metals and its characters.

Objective:

The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.

The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

Outcome:

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

UNIT I

TRANSITION METALS AND THEIR COMPOUNDS - Group study of Titanium, Vanadium, Chromium, Manganese and Iron. Metallurgy and uses of V, W and Mo. Comparison of lanthanides and actinides and their position in the periodic table. Elements with atomic number 104 and 105; preparation and their position in the periodic table. Chemistry of Thorium and Uranium — occurrence, ores, extraction and uses.

UNIT II

BIOLOGICALLY IMPORTANT COORDINATION COMPOUNDS — Chlorophyll, Hemoglobin, Vitamin B 12 — their structure, application (Structure elucidation is not required). Metal carbonyls — Mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn — synthesis, reactions, structure and uses. Nitrosyl compounds — classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside.

UNIT III

ALIPHATIC NUCLEOPHILIC SUBSTITUTIONS — mechanism of SN1, SN2, and SNii reactions, effect of solvents, leaving groups, nucleophiles and structure of substrates.

Elimination reactions — Hoffmann and Saytzeff's eliminations — cis, trans eliminations. Mechanism of E1 and E2 reactions. Relative reactivity of ethyl, vinyl, allyl and benzyl halides.

UNIT IV

POLYHYDRIC ALCOHOLS: Ethylene glycol, glycerol - properties including oxidation using periodic acid and LTA.

Unsaturated alcohols: Thioalcohols — preparation, properties and uses of ethyl mercaptan. Ethers- Methods of preparation of aliphatic and aromatic ethers — reactions of ethers — 1,4-dioxane — preparation and uses — Epoxides — Preparation and reactions. Thioethers — Preparation and uses.

UNIT V

Thermodynamics: system and surrounding — isolated, closed and open systems — homogeneous & heterogeneous systems, State of the system, intensive and extensive variables. Thermodynamic process — cyclic processes, reversible and irreversible, isothermal and adiabatic processes — state and path functions, concept of heat and work. First law of thermodynamics — statements, definition of internal energy (U), enthalpy (H), heat capacity. Relation between C_p and C_v ;

References:

R.D.Madan, G.D.Tuli and S.M. Malik , Selected Topic in Inorganic Chemistry , S.Chand & Co., New Delhi

J.D.Lee , Concise Inorganic Chemistry , E.L.B.S., 4th Edn.

R.B. Puri & L.R.Sharma , Principles of Inorganic Chemistry ,Sultan Chand.

I.L. Finar , Organic Chemistry , Volume I , E.L.B.S. London.

V.S.Parmar & Chawla , Principles of Reaction Mechanisms in Organic Chemistry.

P.L.Soni , Text Book of Organic Chemistry.

Gurdeep Raj , Advanced Physical Chemistry.

Rajaram and Kuriacose , Thermodynamics for Students of Chemistry.

Puri and Sharma , Principles of Physical Chemistry.

Samuel Glasstone , Thermodynamics

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC44L	Physical Chemistry Lab - II	0	0	3	3
Conductometric Experiments					
Cell constant					
Equivalent conductance					
Verification of on- Sager equation					
Acid- base titrations					
Precipitation titrations					
Potentiometric Experiments:					
FAS vs $KMnO_4$					
KI Vs $KMnO_4$					
FAS VS $K_2Cr_2O_7$					
KI Vs $K_2Cr_2O_7$					
Determination of solubility of silver salts.					
COURSE CODE	COURSE TITLE	L	T	P	C
	2501				

Aim:

To develop a basic understanding of electric and magnetic fields in free space using the Integral forms of Maxwell's laws.

Objectives:

Describe the electric field and potential and related concepts, for stationary charges.

Calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential.

Outcomes:

Describe the magnetic field for steady currents and moving charges.

Calculate magnetic properties of simple current distributions using Biot-Savart and Ampere's Laws.

Describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws.

Describe the basic physical content of Maxwell's laws in integral form.

Unit I: Electrostatics

Coulomb's law-Gauss theorem, its application Field due to an infinite long plane, Sphere and Cylinder- Mechanical force on the surface of a charged conductor – Electrostatics energy in The Medium – Capacitors – Principles of a capacitor – Capacity of a capacitor – Capacity of an Isolated sphere and cylinder – Energy of a charged capacitor – Sharing charges and loss of energy.

Unit II: Electricity

Kirchoff's law's and their applications to Wheatstone's network – condition for bridge balance – Carey Forster's bridge – Laws of electromagnetic Induction – Expression for induced EMF – Self and Mutual Induction – Self Inductance of a Solenoid – Mutual inductance of a solenoid Inductor – Coefficient of coupling – Determination of coefficient of self induction by Raleigh's method

Unit III: Atomic Physics

Atom models – Summerfield's and Vector atom Models – Pauli's exclusion principle – various quantum numbers and quantization of orbits.

X-rays – Continuous and Characteristic X-ray – Mosle's Law and its importance Bragg's Law – Miller indices – Determination of Crystal structure by Laue's Powder photograph method.

Unit IV: Nuclear Physics

Nucleus – Nuclear size – charge – Mass and spin – Liquid drop and Shell models.
 Nuclear Radiations and their properties, particle accelator – Betatron and Proton
 Synchrotron, Particle Detectors – Cloud Chamber and Bubble Chambers. Four types
 of reactions – Elementary particles and their classifications

Unit V: Digital Electronics

Decimal – Binary – Octal and Hexa Decimal number systems and their Mutual
 conversions – ‘s and 2’s complement of a Binary number and Binary arithmetic
 (Addition, Subtraction, Multiplication and Division) – Binary subtraction by 1’s and
 2’s complement methods – Basic logic gates – AND, OR, NOT, NOR, NAND and
 EXOR gates – NAND & NOR as universal building gates – Boolean algebra – Laws
 of Boolean algebra – De-Morgan’s Theorems – Their verifications using truth table.

Reference:

- Magnetism and Electricity – Khare and Srivastave – AtmaRam and sons – New Delhi
- Modern Physics – Murughesan – S.Chand and co
- Digital principles and their applications – Malvino and Leach – Tata McGraw Hill
- Hand Book of Electronics – Gupta and Kumar – Pragati Prakasan
- Ancillary Physics II – A Sundaraveluswami

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC46L	Physics Lab - II	0	0	3	2

List of Experiments

- Figure of merits of Galvanometer
- Potentiometer – Ammeter calibration
- Carey Forster Bridge
- Viscosity of Liquid – Poiseulle’s flow method
- Lee’s Disc – Thermal conductivity
- Specific capacity of a liquid
- Spectrometer – Wavelength determination using Grating
- Meter Bridge verification of serial and parallel connections of resistance wires
- Logic Gates – IC Version
- Zener Diode characteristics

COURSE CODE	COURSE TITLE	L	T	P	C
201ENVSTU	Environmental Studies	1	0	0	1

Aim:

To study about the awareness of environmental pollution and its issues.

Objectives:

Creating the awareness about environmental problems among people.

Imparting basic knowledge about the environment and its Ancillary problems.

Developing an attitude of concern for the environment.

Motivating public to participate in environment protection and environment improvement.

Acquiring skills to help the concerned individuals in identifying and solving environmental problems.

Striving to attain harmony with Nature.

Learning Outcomes:

Students who graduate with a major in environmental science will be able to:

Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;

Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;

Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;

Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues; and

Understand how politics and management have ecological consequences.

Nature of Environmental Studies

Definition, scope and importance.

Multidisciplinary nature of environmental studies

Need for public awareness.

Natural Resources and Associated Problems.

Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.

Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.

Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.

Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.

Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.

Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification,

Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Producers, consumers and decomposers.

Energy flow in the ecosystem.

Ecological succession.

Food chains, food webs and ecological pyramids.

Introduction, types, characteristics features, structure and function of the following ecosystem:

- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,
- d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.

Bio — geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

India as a mega — diversity nation.

Western Ghat as a biodiversity region.

Hot— spot of biodiversity.

Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides.

Urban problems related to energy Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issue and possible solutions.

Global wanTling, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation.

Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.

Environmental Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural Industrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems — ponds, river, hill slopes, etc.

References:

- 1) Agarwal, K.C, 2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)
- 3) Brunner R.C., 2089, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- 4) Clank R.S., Marine Pollution, Clarendon Press Oxford (TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) De A.K., Environmental Chemistry, Wiley Western Ltd.
- 7) Down to Earth, Centre for Science and Environment, New Delhi. (R)
- 8) Gleick, H., 2003, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
- 10) Heywood, V.K. & Watson, R.T. 2005, Global Biodiversity Assessment, Cambridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, V.J. 2005, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
- 12) Mickinney, M.L. and School. R.M. 2006, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
- 13) Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).
- 14) Odum, E.P. 2001, Fundamentals of Ecology, W.B. Saunders Co. USA, 574zp.
- 15) Rao M.N. and Dana, A.K. 2007, Waste Water Treatment, Wxford & IBH Publ. Co. Pvt. Ltd., 345p
- 16) Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut
- 20) Survey of the Environment, The Hindu (M)
- 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 20) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)
- 20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
- 21) Wagner K.D., 2008, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
- 22) Paryavaran shastra — Gholap T.N,
- 23) Paryavaran Sahastra — Gharapure

(M) Magazine

(R) Reference

(TB) Textbook

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC51	Inorganic Chemistry - I	5	0	0	5

Aim:

To know about the details of co-ordination compounds and nature of metals.

Objective:

To know about ligand types and their different methods of coordination

To know about isomerism in transition metal complexes.

To know some basic Chemistry of first row transition metal ions.

Outcome:

Able to tell the name of orbitals by recognizing shapes of orbitals.

Able to calculate bond order of different molecules.

The bonding models, structures, reactivities, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics

UNIT - I

Coordination Compounds: Types of ligands. IUPAC nomenclature. Theories of coordination compounds — Werner, Sidgwick, valence bond, crystal field, molecular orbital and ligand field theories.

UNIT- II

Isomerism — stability of complexes — factors affecting the stability of complexes. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes — Trans effect. Application of coordination compounds - Detection of potassium ions, separation of copper and cadmium ions. Estimation of nickel using DMG and aluminium using oxime. Structure of EDTA and its complexes. Complexometric titrations — principles and applications.

UNIT — III

Metallic state: Packing of atoms in metal (BCP, CCP(FCC), HCP). Theories of metallic bonding — electron gas, Pauling and band theories. Structure of alloys — substitutional and interstitial solid solutions — HUME Rothery ratios. Ionic Bond, crystal structure and advanced covalent bonding: Radius ratio rules — Calculation of some limiting radius ratio values for C.N.3(planar triangle), C.N.4 (tetrahedral) & C.N.6 (octahedral).

UNIT — IV

Binary compounds — hydrides, borides, carbides and nitrides — classification, preparation, properties and uses. Organometallic compounds of alkenes and cyclopentadienes.

UNIT - V

Group Theory and its Applications: Symmetry elements —symmetry operations — mathematical group of multiplication tables, point group of simple molecules (H₂, HCl, CO₂, H₂O, BF₃ and NH₃).

References:

P.L.Soni, Text Book of Inorganic Chemistry, S.Chand & Co., New Delhi.

B.R.Poori &L.R. Sharma, Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co., New Delhi.

R.D.Madan, G.D.Tuli and S.M.Malik, Selected Topics in Inorganic Chemistry, S. Chand & Co., New Delhi

J.D.Lee, Concise Inorganic Chemistry, E.L.B.S., 4th Edn.

Jeffery et al., Vogel Text Book of Inorganic Quantitative Analysis, Longman.

Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th edn

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC52	Organic Chemistry - I	5	0	0	5

Aim:

To know about the organic molecules and its reactivity.

Objective:

To know about isomerism types and their different reactivity.

To detail about carbonyl compounds and its reactions.

To know some basic acids and its derivatives .

Outcome:

Describe bonding models and appreciate how these impact on the properties of a simple molecule.

Understand the importance of stereo isomerism and carbonyl compounds on a molecule structure and reactivity.

UNIT – I: STEREOISOMERISM - I

Stereoisomerisms — definition — optical and geometrical isomerism —classification of optical isomerism — optical activity — observed and specific rotation — conditions for optical activity in solid, liquid and gaseous phases —criteria for optical activity. Asymmetric center chirality's — achiral molecule — meaning of + and — and D and L notations — elements of symmetry —racemisation — methods of racemisation (by substitution and tautomerism) —resolution — methods of resolution (mechanical separation, seeding, biochemical and conversion to diastereoisomers) — asymmetric synthesis partial and absolute asymmetric synthesis — Walden inversion, Vant Hoff rule of superposition —m Freudenberg's rule of

shift. Notations for optical isomers — Cahn — Ingold — Prelog rules — R.S. Notations for optical isomer with one asymmetric carbon — erythro and threo representations. Fischer projections, Sawhorse, Newman projections - representation of molecules with two asymmetric carbon atoms.

UNIT- II: STEREOISOMERISM - II

Optical activity in compounds containing no asymmetric carbons -biphenyls, allenes and spiranes. Optical activity on symmetric system (lactic acid, dissymmetric system (1,2- trans cyclopropane dicarboxylic acid). Geometrical isomerism — cis, —trans, syn and anti and E — Z notations-geometrical isomerism in maleic and fumaric acids and in unsymmetrical ketoximes — methods of distinguishing geometrical isomers (dipole moment, dehydration, heat of hydrogenation, cyclisation , melting points) — methods of determining the configuration of geometrical isomers no details required). Geometrical and optical isomerism in three member rings.

UNIT III: REACTIONS OF CARBONYL COMPOUNDS

Carbonyl polarization - reactivity of carbonyl group — acidity of α -hydrogen. Mechanisms of aldol, Perkin, Knoevenagel and benzoin condensations. Mechanisms of Claisen, Reformatsky, Wittig and Cannizzaro reactions. Mechanisms of reduction (sodium borohydride, LiAlH_4 , Wolff — Kishner and MPV reductions) — mechanisms of haloform reaction and Michael addition and Oppenauer oxidation. Photochemistry of carbonyl compounds — Norrish I and II Types. Problems and conversion wherever applicable.

UNIT IV: ACIDS AND ACID DERIVATIVES

Ionization of carboxylic acids — acidity constant- comparison of acid strengths of substituted halo acids — acid strengths of substituted benzoic acids Hammett equation. Hell — Volhard — Zeliniski reaction. Dicarboxylic acids — preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids, unsaturated acids and hydroxy acids. malonic acid, acetoacetic esters — characteristics of reactivities of methylene group — synthetic uses of malonic and acetoacetic esters. Tautomerism — definition — keto-enol tautomerism (identification, acid and bases catalysed interconversion mechanisms. Preparations - amido — imido and — acnitro tautomerisms). Nucleophilic acyl substitutions, acid — base hydrolysis of ester, hydrolysis of amides and trans esterification.

UNIT V: HETEROCYCLIC COMPOUNDS

Aromatic characteristics of heterocyclic compounds. Preparation, properties and uses of furan, pyrrole, & thiophene. Synthesis and reactions of pyridine and piperidine — comparative basic characters of pyrrole, pyridine and piperidine with amines. Synthesis and reactions of Quinoline, isoquinoline and indole with reference to Skraup, Bischler Napieralski and Fischer indole synthesis. Structural elucidation of pyridine, quinoline and isoquinolines.

References:

- B. S. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co, New Delhi. (2098)
- P.L.Soni And H. M Chawala, Text book of Organic Chemistry — 28th edition (2099)- Sultan Chand, New Delhi.
- Ravi Bhushan, Stereoisomerism of Carbon Compounds — CBS —Publishers, Delhi - Revised Edn.
- P.S. Kalsi, Stereochemistry- Conformation and Mechanism, Willey Eastern Ltd., New Delhi
- O.P.Agarwal Chemistry of Natural Products, Volume I & II.
- D. Nasipuri, Stereochemistry of Organic Compounds, Wiley Eastern Ltd., New Delhi
- I.L. finar Organic Chemistry, Vol. I, E.L.B.S, London
- R.K.Bansal, Organic Reaction Mechanisms, Tata Mc-Graw Hill, 2075
- P.S.Kalsi , Organic Reactions and Their Mechanisms, New Age International Publishers.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC53	Physical Chemistry – I	4	1	0	4

Aim:

To know about the physical properties of molecules and its reactivity.

Objective:

To understand different properties of molecular structure.

To understand the basic features of spectroscopy.

To know some basic acids and its derivatives .

To knowledge about thermodynamics and its applications.

Outcome:

Able to recognize different regions for thermodynamics.

Able to explain the concept of thermochemistry.

Able to explain the concept and applications of surface chemistry.

UNIT- I THERMOCHEMISTRY:

Internal energy and enthalpy changes in chemical reactions. Relation between E and H . Relation between enthalpy of reaction at constant volume (q_v) and at constant pressure(q_p). Thermochemical equations, laws of thermochemistry — Hess's law and its applications. Standard states — standard enthalpy of formation, enthalpy of combustion, enthalpy of neutralization, integral and differential heats of solution and

dilution. Bond dissociation energy — its calculation from thermobhemical data, temperature dependence of ΔH - Kirchoff's equation.

UNIT - II SECOND LAW OF THERMODYNAMICS:

Need for the law, different statements of the law- concept of entropy. Entropy as a state function — entropy as a function of P, V and T. Entropy changes in phase changes — entropy of mixing. Gibbs and Helmholtz functions. Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities- ΔA and ΔG as criteria for thermodynamic equilibrium and spontaneity — variation of ΔA and ΔG with P, V, T- Gibbs- Helmholtz equation and their applications — Maxwell's relations.

UNIT - III

APPLICATIONS OF II LAW OF THERMODYNAMICS:

Equilibrium constants and free energy change. Thermodynamic derivation of law of mass action. Equilibrium constants in terms of pressure and concentration — NH_3 , PCl_5 , CaCO_3 . Thermodynamic interpretation of LeChatlier's principle. (concentration, temperature, pressure and addition of inert gases). Equilibrium between different phases — system of variable composition — partial molar quantities — chemical potential of component in an ideal mixture — Gibbs - Duhem equation — variation of chemical potential with T, P, S and X (mole fraction). Reaction isotherm — van't Hoff's equation — van't Hoff's isochore - Clapeyron equation and Clausius Clapeyron equation — Applications.

UNIT - IV

THIRD LAW OF THERMODYNAMICS:

Need for the law. Nernst heat theorem, third law of thermodynamics — statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Exception to third law. (ortho & para hydrogen, CO_2 , N_2O and ice). Thermodynamic properties of real gases — fugacity — definition, calculation (real gases) and variation of fugacity with temperature, pressure and composition (Duhem-Margules equation).

UNIT - V

SURFACE PHENOMENA:

Adsorption and free energy reaction relation at interphase — physisorption and chemisorption — potential energy diagram- Lannord-Jones plot — Langmuir, BET isotherm — surface area determination- heats of adsorption, determination — adsorption from solutions — Gibbs adsorption isotherm. Activity and activity coefficient — definitions. experimental determination of activity and activity coefficients of non-electrolytes — activities in electrolytic solutions — determination of activity coefficient of electrolytes by freezing points.

Reference:

B.R.Puri & Sharma, Principles of Physical Chemistry.

P.L.Soni, Textbook of Physical Chemistry.

Gurdeep Raj, Advanced Physical Chemistry.

B.S.Bahl, G.D.Tuli & Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co.,
New Delhi.(2099).

Samuel Glasstone, Thermodynamics for Chemists.

R.L.Madan, G.D.Tuli, Simplified Course in Physical Chemistr, S.Chand & Co., New
Delhi(2099).

Rajaram and Kuriacose, Thermodynamics for Students of Chemistry.

P.W.Atkins, Physical Chemistry, ELBS, Oxford Univ. Press, 2098.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC54L	Inorganic Qualitative Analysis Lab	0	0	3	3

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.

Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations: Pb, Co, Cd, Fe, Al, Zn, Cu, Ni, Sr, Mg and Sb.

Anions: Sulphide, bromide, chromate, arsenate, fluoride, oxalate, chloride, carbonate and sulphate.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC55L	Gravimetric Analysis Lab	0	0	3	3

Estimation of:
 Barium as barium chromate
 Nickel as nickel dimethylglyoxime complex.
 Lead as lead chromate.
 Calcium as calcium oxalate.
 Lead as lead sulphate.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC56A	Discipline Specific Elective: I Pharmaceutical Chemistry	5	0	0	4

Aim:

To develop pharmaceutical knowledge to the learners.

Objectives:

Imparting basic knowledge about the drugs.

Developing knowledge about pharmacy.

Learning Outcomes:

Students who graduate with a major in Pharmaceutical Chemistry will be able to:
 Understand the principles of Pharmaceutical Chemistry.

To know the knowledge about antiseptic and anaesthetics.

To have employability.

UNIT I

ALKALOIDS — general methods of extraction from a plant source, colour reaction and detection — morphine and quinine with special reference to structure relationship (SAR) and uses. Chemistry of sulphonamides — sulphapyridine phthalyl sulphathiazole — sulpha furazole and protosil — preparation and uses — vitamins — classification of vitamins — vitamin A, B1 and B2, ascorbic acid — their synthesis, estimation and uses.

UNIT II

ENZYMES — characteristics — classification — composition and biological functions — composition of blood and blood plasma — analysis of serum proteins

— functions of plasma proteins — osmotic regulation — functions of hemoglobin, transport of oxygen and maintenance of pH of blood — analysis of hemoglobin in blood — Rh factor — blood pressure — normal, high and low and to control — diagnostic test for sugar, salt and cholesterol in serum — medically important compounds of Al, P, As and Fe — their preparation and applications.

UNIT III

SYNTHESIS OF HETEROCYCLICS - drugs derived from — pyridine derivatives — triphenyl amine and mepyramine — quinoline derivatives — chloroquine and primaquine — pyrimidines — urides and barbiturates. Antibiotics — pharmacological action — structural elucidation — synthesis and rises of chloramphenicol and penidillin.

UNIT IV

ORGANIC DIAGNOSTIC AGENTS — x-ray contrast media (radiopaques) sodium diatrizolate,— evan's blue — indigocarmine — methylene blue — histamine — pentagastrin — xylose and sodium benzoate — clinical estimation of proteins, glucose, urea, blood, cholesterol and hemoglobin — analgesic — classification — narcotic analgesics — morphine and derivatives — totally synthetic analgesic — pethidine and methadones — antipyretic analgesics — salicylic acid derivatives, indolyl derivatives and p-aminophenol derivatives —synthetic — action and uses.

UNIT V

ANAESTHETICS— preparation and uses of general and local gaseous anaesthetics —ether, vinyl ether, methoxy flourane, halogenated hydrocarbons like chloroform, halothane, trichloroethylene, ethyl chloride, cyclopropane, nitrous oxide. Thiopentane sodium, methohexitone and propanoid- local anaesthetics- cocaine and its derivatives. Antiseptic and disinfectants- phenols and related compounds, organic mercurials- dyes, cationic surface active agents, chloramine-T, chlorhexidine, diqualinium chloride. Preservatives, antioxidants, coloring, flavoring and sweetening agents, emulsifying agents-and suspending agents- ointment bases- disintegrating agents.

References:

H.Singh and Kapoor K.V. Vallabh Prakashan, Organic Pharmaceutical Chemistry, New Delhi.

Bently and Drivers, Pharmaceutical Chemistry.

Allion Chidambaram, Pharmaceutical Chemistry.

Chatwal, Organic Pharmaceutical Chemistry.

S. Jayshree Ghosh, Pharmaceutical Chemistry, Chand & Co.

Chatwal, Inorganic Pharmaceutical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC56B	Discipline Specific Elective: I Agricultural Chemistry	5	0	0	4

Aim:

To develop agricultural knowledge to the learners.

Objectives:

Imparting basic knowledge about the soil nature.

Developing knowledge about fertilizers and pesticides.

Learning Outcomes:

Students who graduate with a major in Agricultural Chemistry will be able to:

Understand the principles of Agricultural Chemistry.

To know the knowledge about nutrients and its importance.

To have employability.

UNIT-I

DEFINITION OF SOIL-SOIL composition. Soil Physical properties-soil separates and particle size distribution-soil texture and structure —Bulk density, particle density, pore space, soil air, soil temperature, soil water, soil consistence-significance of physical properties to plant growth. Soil chemical properties — soil colloids —Inorganic colloids — clay minerals — amorphous — Ion exchange reactions —organic colloids — soil organic matter-Decomposition-Humus formation —significance on soil fertility, soil reaction —Biological properties of soil —nutrient availability.

UNIT-II

FERTILIZER — definition-fertilizer recommendation based on soil testing- Nitrogenous fertilizers — Effect of Nitrogen on plant growth and development .Phosphate fertilizers — Effect of phosphorous on plant growth and development.- super phosphate & Bone meal .Potassium fertilizers — function of Potassium on plant growth. Secondary and micronutrient fertilizers — complex and mixed fertilizer- sources. Manufacture, properties and reactions in soils. Biofertilizersnitrogen fixing biofertilizer- rhizobium, azospirillum- Phosphate Mobilizing.

UNIT-III

ORGANIC MANURES —Agricultural, industrial and urban Wastes — preparation of enriched farm yard manures — Zinc enriched organics. Green manures-green leaf

manure-bulky organic and concentrated organic manures -compost — enriched farm yard manures, oil cakes, bone meal, fish meal, guano poultry manures- Fertilizer use efficiency —integrated nutrient management. Preparation of slow release fertilizer- compatability of fertilizers —fertilizers Blending- preparation of different fertilizer mixtures — fertilizer prescription for different soils and crops.

UNIT - IV

PEST MANAGEMENT AND CONTROL .PESTICIDES — formulations — emulsifiable concentrate, water miscible liquids, wettable powders, dusts, granules , classification of pesticides — mode of action — characteristics — uses — fate of pesticides in soil and plants — impact of pesticides on environment — safety measures in the analysis of pesticides.

Insecticides — plant products — Nicotine, pyrethrum, rotenone, petroleum oils. In organic pesticides — Arsenical fluorides, borates. Organic pesticides — organo chlorine compounds — D.D.T , B.H.C, methoxychlor, chloredane, endousulfon.

UNIT - V

FUNGICIDES-inorgnic-sulphur compounds-copper compounds- Mercuric compounds-organic- dithio carbamates – dithane M.boredeaux mixture Herbicides: Inorganic herbidea- Arsenical compounds Boron compound- cyanamide- cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides & Nitro – compounds- chlorinated compound – urea herbicides, Alachlor.

REFERENCES:

- 1.N.C Brady , the Nature and properties of soils Eurasia pudishinghouse,(P) Ltd 9th Ed.2084
2. Biswas,T.D.and Mukeherjee S.K.2087 Text book of soil science.
- 3.A.J.Daji(2070) A Text book of soil science-Asia publishing house,Madras.
- 4.Donahue,R.LMiller,R.W.and shuckluna,J.C.2087.soils-An introduction to soils and plant Growth —Prentice Hall of India (p) Ltd, NewDelhi.
5. Colling,G.H.2055,Commercial Fertilizers-McGraw Hill Publishing Co., New york.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC61	Inorganic Chemistry - II	5	1	0	5

Aim:

To develop knowledge about inorganic metals and its characteristics.

Objective:

To know the differences between transition elements and main group elements.

To know about ligand types and their different methods of coordination.

To know about isomerism in transition metal complexes

Outcome:

Able to write electronic configuration of given atomic number.

Able to tell the name of orbitals by recognizing shapes of orbitals.

Able to calculate bond order of different molecules.

UNIT I

NUCLEAR CHEMISTRY: Introduction—composition of nucleus and nuclear forces, nuclear stability — o/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models. Isotopes —detection and separation. Isotopic constitution of elements and whole number rule-deviation of atomic weights from whole numbers-isobars, isotones and isomers.

UNIT — II

RADIOACTIVITY: Discovery, detection and measurements (Wilson cloud chamber). Radioactive emanations-disintegration theory — decay — group displacement law — rate of disintegration — half-life and average life — Radioactive series. Nuclear transformations — uses of projectiles, nuclear reactors. Applications of radio isotopes — carbon dating — radioactive waste disposal - radiolysis of water and hydrated electron.

UNIT — III

X-RAY CRYSTALLOGRAPHY: Solid state-difference between point groups and space groups — screw axis — glide planes. Crystal symmetry elements-crystal classes-crystal systems-unit cell, Bravais lattices, Asymmetric unit space group-equivalent positions — relations between molecular symmetry and crystallographic symmetry — basic concepts. The concept of reciprocal lattice and its application. X-ray diffraction by single crystal — structure factor — systematic absences. Determination of space group — heavy atom method. Neutron diffraction — elementary treatment. Comparison of X-ray diffraction, electron diffraction — basic principles.

UNIT — IV

SOME SPECIAL CLASSES OF COMPOUNDS: Clathrates-examples and structures. Interstitial compounds and non-stoichiometric compounds. Silicones-composition, raw materials, manufacture, structures, properties and uses. Metal alkyls, co-ordination polymers and phosphonitrilic polymers. Silicates — classification into discrete anions, one, two and three dimensional structures with

typical examples. Composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.

UNIT-V

FOSSIL FUELS:- Varieties of coal and petroleum- petroleum refineries in India. Gaseous fuels-natural, gohar, coal, water, semiwater and producer gases, liquefied petroleum gas (LPG). Safety matches, fire-works and explosives, paints and varnishes. Effluents and their treatment (dye, cement, tannery, distillery units).

Reference:

- P.L. Soni, Mohan Katyal, Text Book of Inorganic Chemistry, 20th Revised Edn., Sultan Chand.
- Esmarch S.Gilreath, Fundamental Concepts of Inorganic Chemistry, International Edn., Mc-Graw-Hill Kogakusha, Ltd.,
- Gurdeep Chatwal and M.S.Yadu, Co-ordination Chemistry, First Edn., Himalaya Publishing House.
- B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, ShobanLal Nagin Chand and Co.,
- Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edn.,
- R.D.Madan, Modern Inorganic Chemistry,
- S.Glasstone, Source Book on Atomic Energy, 3rd Edn., East West Press.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC62	Organic Chemistry – II	5	1	0	5

Aim: To study about the organic and bioorganic molecules and its characteristics.

Objective:

Structural theory, Lewis structures, isomers, basic resonance theory.

Atomic, molecular, and hybrid orbitals, covalent bonding, shapes of molecules.

Polarity of molecules and bonds.

Outcome:

Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Organic Chemistry.

Able to study of biomolecules and its activity.

UNIT — I

NITROCOMPOUNDS AND AMINES : Conversion of nitrobenzene to ortho-, para- and meta- dinitrobenzenes. TNT - aromatic nitro compounds —reduction in neutral, acidic and alkaline media. Relative basic characters of aliphatic and aromatic amines. Ring substitution in aromatic amines, diazotisation and its mechanism. Synthetic applications of diazonium salts, diazomethane and diazoacetic ester — preparation, structure and their synthetic uses. Phenylene diamines, sulphanilic acid, sulphanilamide, saccharin, chloramine-T, diamide — preparation, properties and uses of urea and thiourea.

UNIT — II

AMINOACIDS AND PROTEINS: Classification of aminoacids. Essential and non-essential amino acids. Preparation of L — amino acids, properties and reactions. Zwitter ions, isoelectric points, peptide synthesis. Structure determinations of polypeptides - end group analysis. Proteins-classification based on physical and chemical properties based on physiological functions. Primary and secondary structures of proteins. Helical and sheet structures (elementary treatment only) - denaturation of proteins. Nucleic acid-structures of nucleobases — adenine, guanine, thiamine, uracil and cytosine-nucleosides- nucleotides- polynucleotides - types of nucleic acids — DNA and RNA — biological functions.

UNIT—III

CARBOHYDRATES: Classification, constitution of glucose and fructose. Reactions of glucose and fructose - oxazone formation, mutarotation, and its mechanism, cyclic structure, pyranose and furanose forms. Determination of ring size, formulas, configuration of monosaccharide. Epimerisation, chain lengthening and chain shortening

UNIT—IV

MOLECULAR REARRANGEMENTS: Classification (anionotrophics, cationotrophic) Intermolecular and intramolecular. Pinacol- Pinacolone rearrangement (Mechanism, Evidences for carbonium ion intermediate formation — Migratory aptitude) Beckmann, Benzidine, Hofmann, Curtius, Benzilic acid rearrangements (mechanisms only) Claisen Rearrangement (sigmatropic rearrangement) — Evidence for intramolecular nature and allylic carbon attachment paraclaisen rearrangement, cope and oxycope rearrangements , Fries rearrangement (Two mechanisms).

UNIT — V

NATURAL PRODUCTS: Terpenes, geraniol, nerol, menthol, and α - terpinol Alkaloids — general and methods of isolation and general methods of structural

determination of conine, piperine and nicotine. Vitamins — thiamine, riboflavin, pyrodoxine and ascorbic acid occurrence and biological importance. Structural elucidations of pyridoxine and ascorbic acid.

REFERENCES:

1. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry', 27th Edn., Sultan Chand 2097.
 2. V.S. Parrmar and H.M. Chawla, Principles of Reaction Mechanisms in Organic Chemistry, 27th Edn., Sultan Chand 2098.
- Subash. Chandra Rastogi, Satis Kumar, Agarwala Ashok Kumar 'Sharma', Chemistry of Natural Products, Vol. I & II., 1st Edn. 2074-75.
- Ernest L Elliel, Stereochemistry of Carbon Compounds, Tata Mc-Grave Hill Publishing company Ltd., 20th Edn., 2095
- M. K. Jain, Organic Chemistry, Shoban Lal Nagin Chand and Co., 12th Edn.

COURSE CODE	COURSE TITLE	L	T	P	C
20114AEC63L	Industrial Chemistry Practical	0	0	3	2

1. Estimation of glucose in food samples.
2. Determination of dissolved oxygen in water.
3. Determination of Chemical Oxygen Demand (COD)
4. Determination of Biological Oxygen Demand (BOD)
5. Estimation of phosphoric acid in superphosphate fertilizer.
6. Determination of alkali content in antacid tablet using Hcl.
7. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
8. Testing of turmeric powder, milk and mustard oil for adulterants.
9. Determination of total permanent and temporary hardness of water using EDTA.
10. Measurement of chloride, sulphate and salinity of water samples by simple titration method. (AgNO₃ and potassium chromate)

Suggested Readings

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
3. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut
4. A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
5. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.
6. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
7. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
8. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.

9. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
10. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
11. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
12. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.

COURSE CODE	COURSE TITLE	L	T	P	C
20114AEC64L	Domestic Products Preparation - Practical	0	0	3	2
<ol style="list-style-type: none"> 1. Preparation of enamels. 2. Preparation of shampoo. 3. Preparation of face cream. 4. Preparation of hair remover. 5. Preparation of talcum powder. 6. Preparation of Aspirin and its analysis. 7. Preparation of Magnesium bisilicate (Antacid). 8. Preparation of nail polish and nail polish remover. 9. Preparation of simple organophosphates, phosphonates and thiophosphates 10. To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. 					

Suggested Readings

1. R. Cremlyn: Pesticides, John Wiley.
2. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
3. B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut.
4. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.

5. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
6. Hakishan, V.K. Kapoor: Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, New Delhi.
7. William O. Foye, Thomas L., Lemke , David A. William: Principles of Medicinal Chemistry, B.I. Waverly Pvt Ltd. New Delhi.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC65A	Discipline Specific Elective:II Nano Science	5	0	0	3

Aim: To study about the importance and applications of Nano science.

Objective:

- To foundational knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications.
- To help them understand in broad outline of Nanoscience.

Outcome:

- Learn about the background on Nanoscience
- Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
- Apply their learned knowledge to develop Nanomaterial's.

UNIT I:

INTRODUCTION AND HISTORY

Background to nanotechnology - scientific revolutions –atomic structure-atomic size – bottom up/top down nanotechnology-chemical reactivity-Incremental nanotechnology-Evolutionary nanotechnology-Radical nanotechnology-Emergence of nanotechnology-Challenging in nanotechnology-Misnomers and misconception of Nanotechnology.

UNIT II:

2523

EVOLUTION AND GROWTH OF NANOSYSTEM

Basic problems and limitations - opportunities of nano scale -evolution of band structures and Fermi surface. Nanoparticles through homogeneous and heterogeneous nucleation-Growth controlled by surface and diffusion process- Oswald ripening process - influence of reducing agents-solid state phase segregation- grain growth and sintering precipitation in solid solutionhume rothery rule.

UNIT III:

NANOMATERIALS AND CLASSIFICATIONS

Carbon Nanotubes (CNT) - Metals (Au, Ag, Pd, Cu) - Metal oxides (TiO₂, CeO₂, ZnO, MgO) - Semiconductors (Si, Ge, CdS, ZnSe). Classifications of nanomaterials-zero dimensional-one dimensional-two dimensional-three dimensional nanostructures- Quantum dots-Quantum wireQuantum well-semiconductors and ceramics.

UNIT IV: SPECIAL NANOMATERIALS

Carbon fullerenes-fullerene derived crystals- carbon nanotubes. Micro and Mesoporous materialOrdered mesoporous materials-Random mesoporous materials-crystalline microporous materials.Core/Shell structures-Metal oxide structures-Metal polymer structures-Intercalation compounds-nanograined materials.

UNIT V: MATERIALS STRUCTURE AND PROPERTIES

Space lattice and unit cells, crystal system, Symmetry operation, Structures of common metallic, Semiconductor ceramic and superconductor materials, Miller Indices, Packing fractions, Formation of dangling bonds-atom like behavior of nanomaterials-physicochemical properties. Optical properties of nanomaterials-semiconductor-metal nanoparticles-Electrical and electronic propertiesThermal properties-Ferro electric properties-mechanical and magnetic properties.

Reference:

1. Introduction to Nan science, By Gabor L. Hornyak, Joydeep Dutta, H.F. Tibbals, Anil Rao
2. Introduction to Nanoscience and Nanotechnology, By Chris Binns
3. Foundations of Nanotechnology, Volume Two: Nanoelements Formation and .,
By Sabu Thomas, Saeedeh Rafiei, Shima Maghsoodlou, Arezo Afzali
4. Nanocomposite structures and dispersions, By Ignac Capek
5. Morphology Control of Materials and Nanoparticles: Advanced Materials ..., edited by Yoshio Waseda, Atsushi Muramatsu
6. Nanomaterials: Synthesis, Properties and Applications, Second Edition, edited by A.S Edelstein, R.C Cammaratra
7. Nanomaterials: New Research, By B. M. Caruta.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC65B	Discipline Specific Elective:II Polymer Chemistry	5	0	0	3

Aim: To develop knowledge about polymers to the learners.

Objectives:

- Imparting basic knowledge about the different types of polymers.
- Developing knowledge about production and advantages of polymers.

Learning Outcomes: Students who graduate with a major in Polymer Chemistry will be able to:

- Understand the principles of Polymer Chemistry.
- To know the knowledge about various techniques of polymers and its importance.
- To have employability.

UNIT — I

Basic concepts- an introduction of polymers and macromolecules. Natural and synthetic polymers. Molecular forces and chemical bonding polymers. Classification of polymers- addition and condensation polymers. General methods of preparation of polymers. Polymerisation through functional groups, multiple bonds and ring opening. Polymerisation techniques- bulk, solution, suspension and emulsion polymerization.

UNIT—II

Copolymerisation- homo and copolymers. Block copolymers and graft copolymers. Kinetics of free radical and cationic polymerization reactions. Mean kinetic chain length, degree of polymerization. Inhibition and retardation.

UNIT — III

Thermoplastic and thermosetting resins. Constituents of plastics, fillers, dyes, pigments, plasticizers, lubricants and catalysts. Acrylics, polyvinyl and cellulose derivatives of thermoplastic resins. Silicone resins, epoxy resins, phenolic resins and alkyl resins of thermosetting resins.

UNIT — IV

Nylon 66, terylene, viscose rayon, polyesters —definition and polymer requirement. Polymers of acrylic acid, methacrylic acid and poly acrylates.

UNIT — V

Polymer structure- linear, branched and cross-linked polymers- isotactic, syndiotactic and atactic. Properties- melting point, glassy state, glass transition temperature. Thermal analysis of polymers, thermal high energy radiation, oxidative and hydrolytic polymer degradation.

REFERENCES:

1. Introduction to Polymers by R. J. Young and P. A. Lovell.
2. Polymer Chemistry: An Introduction” by Malcolm P. Stevens.
3. Polymer Chemistry” by B.K. Sharma.
4. Introductory Polymer Chemistry ” by G.S. Misra.
5. Textbook of polymer Science-FW Billmeyer
6. Introduction of Polymer Chemistry, R.P. Seymour Mc-Graw Hill, New York,
7. Polymer Science, V.R. Gowrikar, N. V. Viswanathan,Wiley Eastern Ltd.

COURSE CODE	COURSE TITLE	L	T	P	C
201LSCCE	Community Engagement	-	-	-	1

a) Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

b) Learning outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

c) Contents

Divided into four Modules, field immersion is part of each Unit

S. No.	Module Title	Module Content	Assignment	Teaching/ Learning Methodology	No. of Classes
1	Appreciation of Rural Society	Rurallifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages’ (Gandhi), rural infrastructure	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	- Classroom discussions - Field visit** - Assignment Map	2 4 2
2	<i>Understanding rural economy & livelihood</i>	Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Describe your analysis of rural household economy, its challenges and possible pathways to address them	- Field visit** - Group discussions in class - Assignment	3 4 1
3	<i>Rural Institutions</i>	Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration	How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	- Classroom - Field visit** - Group presentation of assignment	2 4 2

4	Rural Development Programmes	History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	- Classroom - Each student selects one program for field visit** - Written assignment	2 4 2
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COURSE CODE	COURSE TITLE	L	T	P	C
201SSCIM	Interview Skills Training and Mock Test	-	-	-	2

Objectives:

Preparing for your job interview could very well be one of the most important moments of your career.

Learning Outcomes:

Prepare for the interview.

Know common interview questions and questions to ask your future employer.

Describe body language and its impact on the interview.

Course Goals

Lesson One: Interview Preparation

Lesson Two: Common Interview Questions

Lesson Three: What Employers Want

Lesson Four: Attitude and Effort

Lesson Five: Body Language

Lesson Six: Research

Lesson Seven: The Mock Interview

Lesson Eight: Phone Interviews

Lesson Nine: Behavioral Interviews

Lesson Ten: Closing the Interview

Lesson Eleven: Thank You Notes

Revised content

COURSE CODE	COURSE TITLE	L	T	P	C
20114PEE	Programme Exit Examination	0	0	0	1

UNIT - I

General Reasoning: Analytical Reasoning, Syllogisms, Analogies, Directions, Coding-Decoding, Classification Alphabet Series, Symbols and Notations, Similarities and Differences, Number Series, Blood Relationships Arrangements, Statements, Data Sufficiency, Non-verbal Reasoning, Visual Ability, Graphical Analysis Data Analysis

General Aptitude: Simplifications, Number System, Average, Algebra, Percentage Time & Work

Simple & Compound Interest, Time & Speed, HCF, LCM Problems, Area, Profit & Loss, Bar Graph, Pictorial Graph, Pie Chart Ratio & Proportion, Permutation & Combination

UNIT - II Inorganic Chemistry

General Chemistry: periodic trends, electronic structure, acid-base theory and reactions, balancing equations, stoichiometry, oxidation states and nuclear chemistry.

Structure and bonding: Lewis diagrams, molecular geometries and VSEPR concept, valence bond description and hybridization, bond energies, van der Waals radii of the elements, molecular orbitals and intermolecular forces

Metallic and ionic substances: lattice structure, lattice energies, theory of metallic bonding, conductors, semiconductors, superconductors and liquid crystals.

Chemistry of the main group elements: physical and chemical properties of the elements and their compounds, and occurrences and recovery.

Chemistry of the transition elements: electronic structures, physical and chemical properties of the elements and their compounds, occurrences and recovery, coordination chemistry, including ligands, stereochemistry, nomenclature, bonding, spectroscopy, thermodynamic and kinetic aspects.

Special topics: bioinorganic chemistry, catalysis, environmental chemistry, organometallic chemistry, including effective atomic number rule, bonding and reactions

Unit - III Organic Chemistry

Molecular structure: bonding, Lewis structures, orbital hybridization, resonance, aromaticity, stereochemistry, conformational analysis, acid base properties, IUPAC nomenclature, IR, NMR, UV/visible spectroscopy and mass spectrometry.

Functional groups: preparation and reactions of alkanes, alkenes, alkynes, dienes, alkyl halides, alcohols, thiols, ethers, sulfides, epoxides, aromatic compounds, aldehydes, ketones, amines, carboxylic acids and their derivatives.

Reaction mechanisms: electrophilic substitutions and eliminations, nucleophilic substitutions and additions, nucleophilic addition-eliminations, cycloadditions, and radical reactions, catalysis, reaction coordinate diagrams, thermodynamic and kinetic control, stereochemistry of reactions, relative reactivities, relative stabilities and reactive intermediates (carbocations, carbanions, radicals, carbenes, enols, enolates, etc.)

Biochemistry: carbohydrates, amino acids, peptides, proteins, lipids, alkaloids, pharmaceuticals, nucleotides and nucleic acids, glycoproteins, polysaccharides, terpenes and steroids

Special topics: catalysis, organometallic chemistry, polymers and rearrangements

Unit - IV Physical Chemistry

Thermodynamics: first, second and third laws; equilibrium constants; spontaneity; LeChatelier's principle; thermochemistry; mixing; phase equilibria; colligative properties; electrochemistry and statistical thermodynamics

Kinetics: kinetic theory of gases, ideal and real gas equations and properties, rate laws, rate constants, half-life, reaction mechanisms, enzyme kinetics, activated complex theory, collision theory, photochemistry and solution dynamics.

Quantum chemistry and applications: classical experiments, principles of quantum mechanics, atomic and molecular structure, molecular spectroscopy

Unit -V Analytical Chemistry

Experimental design and data acquisition: accuracy and precision, random and systematic error, standard deviation, confidence limits, calibration, detection limits, sensitivity and significant figures

Homogeneous equilibria: acid-base equilibria and titrations, redox reactions and titrations, electrochemical cells and complexometric titrations

Heterogeneous equilibria: gravimetric analysis, solubility and chemical separations

Solutions: concentration terms, ionic strength and activity, standardizations and primary standards

Instrumental methods: Beer's law, spectroscopic methods, chromatographic methods, radiochemical methods, electrolysis, potentiometry and lasers



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SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc CHEMISTRY CURRICULUM

REGULATION 2019



SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF CHEMISTRY
M.Sc CHEMISTRY – REGULATION 2019
COURSE STRUCTURE

M.Sc. Graduate Attributes

- Domain knowledge
- Investigative
- Critical thinking
- Resourceful and Responsible
- Effective Communication
- Ethical and Moral values

M.Sc. Programme Educational Objective – PEO

- PEO1-To demonstrate broad knowledge of descriptive Chemistry.
- PEO2-To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.
- PEO3- To motivate critical thinking and analysis skills to solve complex chemical problems, e.g., analysis of data, synthetic logic, spectroscopy, structure and modeling, team-based problem solving, etc.
- PEO4-To demonstrate an ability to conduct experiments in the above sub-disciplines with mastery of appropriate techniques and proficiency using core chemical instrumentation and modeling methods.
- PEO5-To demonstrate the ability to perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions.
- PEO6-To develop skills in quantitative modeling of static and dynamic chemical systems.
- PEO7-To develop laboratory competence in relating chemical structure to spectroscopic phenomena.
- PEO8-To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

M.Sc Programme Outcome –PO

- PO1-Think critically and analyze chemical problems.
- PO2-Present scientific and technical information resulting from laboratory experimentation in both written and oral formats.
- PO3-Work effectively and safely in a laboratory environment.
- PO4-Use technologies/instrumentation to gather and analyze data.
- PO5-Work in teams as well as independently.
- PO6-Apply modern methods of analysis to chemical systems in a laboratory setting.

M.Sc Course -C

- C1-Organic Chemistry-I
- C2-Inorganic Chemistry-I
- C3-Physical Chemistry-I
- C4-Research Led Seminar
- C5-Organic Chemistry-II
- C6-Inorganic Chemistry-II
- C7-Physical Chemistry-II
- C8-Research Methodology
- C9-Participation in Bounded Research
- C10-Organic Chemistry-III
- C11-Inorganic Chemistry-III
- C12-Physical Chemistry-III
- C13- Participation in Scaffold Research
- C14-Project Work

M.Sc Curriculum Mapping

Programme Educational Objectives Vs Programme Outcome

Programme Outcome-PO Programme Educational Outcome - PEO	PO1	PO2	PO3	PO4	PO5	PO6
PE01	✓					
PE02						
PE03		✓				
PE04			✓			
PE05						
PE06					✓	
PE07				✓		
PE08						✓

M.Sc Curriculum Mapping

Programme Outcome vs Courses Outcome

Programme Outcome-PO Courses Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	
CO12	*	*		*	*	
CO13		*	*	*	*	
CO14		*	*	*	*	*

M.Sc. CHEMISTRY SYLLABUS – REGULATION 2019



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M.Sc CHEMISTRY – REGULATION 2019
COURSE STRUCTURE

SEMESTER - I					
COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC11	Organic Chemistry-I	5	0	0	4
19214SEC12	Inorganic Chemistry-I	5	0	0	4
19214SEC13	Physical Chemistry-I	5	0	0	4
19214SEC14L	Organic Chemistry Lab-I	0	0	5	2
19214SEC15L	Inorganic Chemistry Lab-I	0	0	5	2
19214DSC16_	Discipline Specific Elective-I	5	0	0	4
19214RLC17	Research Led Seminar	-	-	-	1
	Total	20	0	10	21
SEMESTER - II					
19214SEC21	Organic Chemistry-II	4	0	0	4
19214SEC22	Inorganic Chemistry-II	4	0	0	4
19214SEC23	Physical Chemistry-II	4	0	0	4
19214SEC24L	Organic Chemistry Lab-II	0	0	5	2
19214SEC25L	Inorganic Chemistry Lab-II	0	0	5	2
19214DSC26_	Discipline Specific Elective-II	5	0	0	4
19214RMC27	Research Methodology	3	0	0	2
19214BRC28	Participation in Bounded Research	-	-	-	2
	Total	20	0	10	24
SEMESTER - III					
19214SEC31	Organic Chemistry-III	5	0	0	5
19214SEC32	Inorganic Chemistry-III	5	0	0	5
19214SEC33L	Physical Chemistry Lab-I	-	0	5	3
19214SEC34L	Physical Chemistry Lab-II	-	0	5	3

19214DSC35_	Discipline Specific Elective-III	5	0	0	4
192_ _ OEC36	Open Elective	4	0	0	2
19214SRC37	Participation in Scaffold Research (Design and Societal Project)	-	-	-	2
	Total	19	0	10	24
SEMESTER - IV					
19214SEC41	Physical Chemistry-III	6	1	0	6
19214SEC32	Industrial Chemistry	6	1	0	5
19214DSC43_	Discipline Specific Elective-IV	5	0	0	4
19214PRW44	Project	-	-	-	10
19214PEE	Programme Exit Examination	-	-	-	2
	Total	17	2	0	27
	Total Credits of this Program				96

DISCIPLINE SPECIFIC ELECTIVE COURSES –I

Semester	Elective No.	Course Code	Course Title
I	I	19214DSC16A	a) Environmental Chemistry
		19214DSC16B	b) Supramolecular Chemistry

DISCIPLINE SPECIFIC ELECTIVE COURSES –II

Semester	Elective No.	Course Code	Course Title
II	II	19214DSC26A	a) Special Topics in Chemistry
		19214DSC26B	b) Macromolecules as Engineering Materials.

DISCIPLINE SPECIFIC ELECTIVE COURSES –III

Semester	Elective No.	Course Code	Course Title
III	III	19214DSC35A	a) Medicinal Chemistry
		19214DSC35B	b) Green Organic Synthesis: Principles and Applications

DISCIPLINE SPECIFIC ELECTIVE COURSES –IV

Semester	Elective No.	Course Code	Course Title
IV	IV	19214DSC43A	a) Nano Chemistry
		19214DSC43B	b) Material Chemistry

OPEN ELECTIVE COURSES

Semester	Course Code	Course Title
III	19211OEC	Writing for the Media
	19212OEC	Applicable Mathematical Techniques
	19213OEC	Biomedical Instrumentation
	19215OEC	Herbal Medicines
	19220OEC	M-Marketing
	19261OEC	Financial Service
	19280OEC	Counselling and Psychology

CREDIT DISTRIBUTION

SEMESTER	SEC	GEC	DSE	RESEARCH	OTHERS	TOTAL
I	19		04	01		24
II	19		04	05		28
III	19	03		02		24
IV			04	10	02	16
TOTAL	57	03	12	18		92

SEMESTER – I

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC11	Organic Chemistry – I	5	0	0	5

Aim:

- To acquaint students with learning Organic Chemistry.

Objective:

- To sensitize students to learn Important components of Organic Chemistry.

Outcome:

Having successfully completed this module you will be able to:

- Recognise many functional groups and their reactivity
- Set up glassware and apparatus to conduct experiments in Organic Chemistry.
- Interpret data from a range of physical techniques to characterise Organic compounds.
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis

Unit - I**Bonding, Structure & Aromaticity**

Hybridization with reference to carbon compounds-Shapes of simple organic molecules-bond angle and bond length in organic molecules. Electronegativity of atoms and groups. Dipole moments of molecules-Applications of dipole moment to study the properties of organic molecules. Polarity of solvents. Hydrogen bonding-Inter and Intramolecular hydrogen bonding. **Electronic Effects**-Inductive, resonance and hyperconjugative effects and their influence-rules of resonance. Tautomerism. Steric effects. Aromatic character-Huckel's rule and applications-Craig's rule and applications-Consequences of aromaticity – non-alteration in bond length-Resonance energy from heat of hydrogenation, heat of combustion and Huckel's MO calculation, antiaromatic compounds.

Unit - II

Essentials of Organic Stereochemistry

Principles of symmetry-concept of chirality. Molecular symmetry and chirality. Newmann, Sawhorse, Fischer and Wedge representations and their interconversions. Types of molecules exhibiting optical activity. Configurational nomenclatures of acyclic and cyclic molecules: *cis-trans* and *E,Z* – and *D, L; R, S*; erythro and threo; *syn* and *anti*; *endo* and *exo*. Stereochemistry of molecules with axial chirality-atropisomerism – biphenyls-allenes, spiranes and analogues. Helicity and chirality. Topocity and prostereoisomerism- Diastereotopic ligands and faces. Resolution –methods of Resolution. Conformations six membered ring systems and their optical activity. Quantitative correlation between conformation and reactivity- Winstein-Eliel equation

Unit - III

Reactive Intermediates Methods of Determining Reaction Mechanisms

Carbocations, Carbanions, Carbenes and Nitrenes – Generation and stability of reactive intermediates. Correlation of reactivity with structure of reactive intermediates. Free radicals – Configurations – Identification by chemical and spectral methods – Free radical halogenation - NBS. Types of reactions: Homolytic and Heterolytic cleavages of bonds. Thermodynamic and kinetic aspects, Hammond's postulate, isotope effects. Energy profile diagrams –Intermediate versus transition state, Product analysis and its importance, Crossover experiments, Kinetic methods, Stereochemical studies, Isotopic and substituent effects

Unit - IV

Nucleophilic Substitutions in Aliphatic and Aromatic Substrates

SN1 and SN2 mechanisms-effect of substrate structure, leaving group, attacking nucleophile and solvent polarity-neighbouring group participation-substitution at vinylic and allylic carbons and reactivity. Ambient nucleophiles and substrates. Hydrolysis of esters-mechanisms. Selected reactions-Von-Braun, Dieckmann, Williamson. SNAr mechanism- SN1 (Aromatic) mechanism with evidences - Benzyne mechanism - Effect of substrate structure, leaving group, attacking nucleophile and solvent.

Unit -V

Heterocycles

Nomenclature of heterocycles having not more than two hetero atoms such as oxygen, nitrogen and sulphur. Synthesis, reactivity and applications of the following heterocycles: Pyrazoles, Oxazoles, Pyridazines, Pyrimidine and Pyrazines.

employability/Entrepreneurship/Skill development

REFERENCES

1. March J, *Advanced Organic Chemistry*, Fourth Edition, John-Wiley and Sons, New York (1992).
2. Sykes P, *Guide Book to Mechanism in Organic Chemistry*, Sixth Edition, ELBS with Longmann (1997).
3. Eliel E L, *Stereochemistry of Carbon Compounds*, Tata-McGraw Hill Publishing Company, New Delhi (1998).
4. Finar, I.L, *Organic Chemistry Volume 2*, Sixth Edition, ELBS with Longmann, Singapore (1997).
5. Nasipuri D, *Stereochemistry of Carbon Compounds*, Second Edition, New-Age International Publishers, New Delhi (1996).
- 6..Kalsi P.S, *Stereochemistry – Conformation and mechanism*. Wiley Eastern Limited.
7. Kalsi P.S., *Stereochemistry and mechanism through solved problems*. Second New Age International Publishers.
8. Nasipuri D., *Stereochemistry of Organic Compounds.*, New Age International Publishers.
9. Mukherji S.M. and Singh S.P., *Organic Reaction Mechanism*, Macmillan India.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC12	Inorganic Chemistry – I	5	0	0	4

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- .
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis

Unit - I

18 electron rule - EAN rule - theories of coordination compounds - valence bond theory - crystal field theory - splitting of d orbitals in different symmetries - crystal field stabilization energy - factors affecting the magnitude of $10 Dq$ - evidence for crystal field stabilization - spectrochemical series - site selection in spinels - tetragonal distortion from octahedral symmetry - Jahn-Teller distortion - molecular orbital theory - octahedral complexes - tetrahedral and square planar complexes - pi bonding and molecular orbital theory - experimental evidence for pi bonding.

Unit - II

Term states of dn ions - electronic spectra of coordination compounds - selection rules - band intensities and band widths - energy level diagrams of Orgel and Tanabe - Sugano - spectra of Ti^{3+} , V^{3+} , Ni^{2+} , Cr^{3+} , Co^{2+} , Cr^{2+} and Fe^{2+} - calculation of $10Dq$ and B for V^{3+} (oct) and Ni^{2+} (oct) complexes.

Magnetic properties of coordination compounds - change in magnetic properties of complexes in terms of spin orbit coupling - temperature independent paramagnetism - spin cross over phenomena.

Unit - III

Substitution reactions in square planar complexes - the rate law for nucleophilic substitution in a square planar complex - the trans effect - theories of trans effect - mechanism of nucleophilic substitution in square planar complexes - kinetics of octahedral substitution - ligand field effects and reaction rates - mechanism of substitution in octahedral complexes - reaction rates influenced by acid and bases - racemization and isomerization - mechanisms of redox reactions - outer sphere mechanisms - excited state outer sphere electron transfer reactions - inner sphere mechanisms - mixed valent complexes.

Unit - IV

Structure of coordination compounds with reference to the existence of various coordination numbers - complexes with coordination number two - complexes with coordination number three - complexes with coordination number four - tetrahedral and square planar complexes - complexes with coordination number five - regular trigonal bipyramidal and square pyramidal - site preference in trigonal bipyramidal complexes - site preference in square planar complexes - isomerism in five coordinate complexes - coordination number six - distortion from perfect octahedral symmetry - trigonal prism - geometrical isomerism in octahedral complexes - coordination number seven and eight.

Unit - V

Inorganic chains - rings - cages and clusters - catenation - heterocatenation - intercalation chemistry - one dimensional conductor - isopolyanions - heteropolyanions - borazines - phosphazenes - phosphazene polymers - ring compounds of sulphur and nitrogen - homocyclic inorganic systems - cages - boron cage compounds - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters - structural prediction of organometallic clusters.

employability/Entrepreneurship/Skill development

References

1. Inorganic Chemistry - Principles of structure and reactivity, Fourth Edition J. E. Huheey, E. A. Keiter and R. L. Keiter - Addition Wesley Publishing Co, NY, 1993.
2. Advanced Inorganic Chemistry - F. A. Cotton and G. Wilkinson
3. Mechanism of Inorganic reactions - F. Basolo and R. G. Pearson
4. Inorganic Chemistry - R. B. Heslop and P. L. Robinson
5. Introduction to Ligand Fields - B. N. Figgis - Wiley Eastern Ltd, New Delhi, 1976.
6. Inorganic Chemistry - Keith F.Purcell and John C.Kotz,, Saunders Golden Sunburst Series, W.B.Saunders Company, Philadelphia, 1977.
7. Inorganic Chemistry - Shriver, Atkins and Longford, ELBS, 1994.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC13	Physical Chemistry – I	5	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry .

Objective:

- To learn the importance of Physical Chemistry.

Outcome:

- Having successfully completed this module you will be able to:

- Determine rate constants and half-life for 0, 1st and 2nd order reactions from experimental datasets.
- Understand and apply the Boltzmann distribution and its effect on the observed spectra; integrate most functions encountered in chemical practice.
- Solve separable first-order ordinary differential equations.

UNIT - I

Classical Mechanics

Symmetry of space and its relation to conservation laws-Conservation theorems - conservation of linear momentum, angular momentum and energy-Equations of motion - Newtonian, Lagrangian, Hamiltonian- Definition of classical mechanics, quantum mechanics and relativistic mechanics- Assumptions of classical mechanics. Classical wave equation- Conversion of classical wave equation into Schrodinger wave equation- Failure of Classical mechanics-Black body radiation-Photoelectric effect-Heat capacity of substances-Hydrogen atom spectrum.

UNIT- II

Mathematics for Quantum Chemistry

Functions - definition, classification-Linearly dependent and independent functions, odd and even functions-Inner product - normalization - orthogonality - orthonormal functions-Kronecker delta - Eigen functions - need for normalization. Operators - Linear, angular momentum, energy operators-Linear and non-linear operators. Hermitian operators and their properties- Proof for Hermiticity of linear, angular, position and Hamiltonian operators-Commutator of operators-Commutation relation among angular momentum operators L_x, L_y, L_z - Vectors - vector space - Euclidean space, Hermitian space, Hilbert space.

UNIT - III

Basic Quantum Chemistry

Wave - particle dualism-Compton effect-Uncertainty principle and its applications-Postulates of quantum mechanics-Setting up Schrodinger wave equation and solving for particle in a 1D and 3D box, Harmonic oscillator, Rigid rotor, Hydrogen atom-Hydrogen atomic orbitals-Analytical and graphical representations-Radial probability distribution function-Orthogonality of 1s, 2s, 2p orbitals- Many electron atom – one electron orbital and one electron potential, Pauli's exclusion principle, Slater's determinant.

UNIT -IV

Fundamentals of Statistical Thermodynamics

Permutations and combinations-Combinatory rule – probability theorems. Microstates, macrostates-Methods of counting microstates of distinguishable and indistinguishable particles-Heat capacity of solids-Einstein and Debye models-Maxwell-Boltzmann statistics-Phase space-Thermodynamic probability-Statistical equilibrium. Derivation of

M.B. statistics-Relationship between entropy and probability-Statistical meaning of third law of thermodynamics.

UNIT -V

Applications of Statistical Thermodynamics

Partition functions -Translational, rotational and vibrational partition functions of diatomic molecules-Translational, rotational and vibrational partition functions of polyatomic molecules-Electronic partition function-Derivation of thermodynamic quantities E, S, A, H, G, K and Cp, Cv using partition function-Sackur-Tetrode equation- Quantum statistics. Bose Einstein statistics-Behaviour of helium at low temperature-Fermi Dirac statistics.

employability/Entrepreneurship/Skill development

REFERENCES:

1. Prasad R.K. Quantum Chemistry, I Edition, New Delhi, Wiley Eastern Ltd, (1992) - Unit 1, 2, 3
2. Anderson J. M. Mathematics of Quantum Chemistry, I Edition, Massachusetts, W.A.Benjamin Inc. (1966)- Unit 2
3. Kuriakose. J.C. and Rajaram J.C. Thermodynamics Jalandar Shoban Lal Co., (1996)- Unit 4, 5
4. Gupta and Kumar Classical Mechanics – Unit 1

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC14L	Organic Chemistry Lab – I	0	0	5	3

Aims: The organic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecturebased part of the course. The students will be introduced to key synthetic techniques and will regularly employ spectroscopic techniques to examine the outcome of experiments.

Objectives: To perform seven experiments that have been divided into 3 topics:

Functional group interconversions, carbon-carbon bond formation / enolate chemistry, and electrophilic aromatic substitution. To take part in spectroscopy workshops that will demonstrate further topics in spectroscopy and the use of spectroscopic techniques in the characterisation of organic compounds. To learn new synthetic techniques: distillation under reduced pressure, reactions involving continuous removal of water and preparative chromatography. To gain experience in the identification and characterisation of unknown products using ^1H NMR spectroscopy, ^{13}C NMR spectroscopy, IR spectroscopy and mass spectrometry. To introduce the concept of multi-step organic synthesis.

ORGANIC CHEMISTRY LAB – I

Qualitative analysis of an organic mixture containing two components.

- Pilot separation
- Bulk separation
- Analysis
- Derivatization

Preparation of Organic compounds (Single stage)

- Glucose pentaacetate from glucose (acetylation)
- Resorcinol from resorcinol (acetylation)
- Benzophenone oxime from benzophenone (addition)
- p*-Benzoquinone from hydroquinone (oxidation)
- Phenyl-azo-2-naphthol from aniline (diazotization).

employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC15L	Inorganic Chemistry Lab – I	0	0	5	3

Aims:

The inorganic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture-based part of the course. To equip students with the basic skills and expertise required to carry out

careful and precise procedures in the modern practical chemistry laboratory whilst providing experiments that illustrate and support the lecture course. To train students in the art of good scientific report writing and in the use of spectroscopic techniques for the structural elucidation of inorganic compounds. To encourage student to become more aware of the risks and hazards associated with careful laboratory work and to assess risks and methods for minimizing them.

Objectives:

Analytical Experiments:

(1) To be familiar with the use of pipettes, burettes and analytical balances. To be able to transfer quantitatively liquids and solids.

(2) To be familiar with the techniques of gravimetric analysis, complexometric titration, colorimetry and atomic absorption spectrometry for the analysis of inorganic compounds.

(3) To learn about gases in the environment and how to analyse for concentrations of gas components via spectrophotometry and IR spectroscopy. In modern analytical chemistry instrumental methods are replacing traditional titration and gravimetric methods. Nevertheless, a good grasp of the basic techniques is essential in all forms of instrumental analysis.

Among these techniques are:

- (a) the ability to make up a standard solution
- (b) the ability to make careful measurements
- (c) an appreciation of errors and significant figures.

INORGANIC CHEMISTRY LAB – I

1. Qualitative analysis: Qualitative analysis employing semi-micro methods and spot tests of mixtures of common cations and ions of the following less familiar elements. Molybdenum, tungsten, selenium, tellurium, cerium, thorium, titanium, zirconium, vanadium, uranium and lithium.

2. Colorimetry: Colorimetric estimations of copper, nickel, iron and chromium using photoelectric colorimeter.

3. Industrial analysis: (i) Analysis of two of the following alloys: brass, bronze, stainless steel, solder type metal. (ii) Analysis of any one of the following: cement, glass, ultramarine.

4. Titrimetry: Complexometric titrations involving estimations of calcium, magnesium, nickel, zinc and hardness of water.

5. Quantitative analysis: Quantitative analysis involving volumetric and gravimetric estimations of at least four mixtures of cations.

6. Preparation of inorganic complexes: About six preparations involving different techniques selected from the following.

(i) Potassium tris(oxalato)aluminate

(ii) Nickel ammonium sulphate

(iii) Tris(thiourea)copper(I) chloride

(iv) Potassium tris(oxalato)ferrate

(v) Hexamminecobalt(III) chloride

(vi) Ammonium hexachloro stannate(IV)

(vii) Tetrammine copper(II) sulphate

(viii) Cis and trans bis(glycinate) copper.

employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC16A	Discipline Specific Elective - I Environmental Chemistry	5	0	0	4

Aim: To learn the important of Environmental Chemistry.

Objective:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its Ancillary problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Outcomes:

Students who graduate with a major in environmental science will be able to:

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
- Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues; and
- Understand how politics and management have ecological consequences.

UNIT – I

Pollution

Environmental pollution - structure of atmosphere - biogeological cycles - oxygen - nitrogen – carbon – phosphorous – sulphur - biodistribution of elements - air pollutions - reactions in atmosphere - primary pollutants - air quality standards - analysis of CO, nitrogen oxides, sulphur oxides, hydrocarbons and particulate matter - particulate pollution - control methods - vehicular pollution - green house effect and global warming - climatic changes – ozone - photochemical smog - acid rain - sampling - monitoring – control.

UNIT – II

Water Pollution

Hydrosphere: Water pollution - hydrological cycle - chemical composition - sea water composition - water quality criteria for domestic and industrial uses - BIS and WHO standards - ground water pollution - surface water pollution - lake and river water - eutrophication - marine pollution - water pollutants - biodegradability of detergents – pesticides - endosulfan and related case studies.

UNIT – III

Water Treatment

Principles of water and waste water treatment - aerobic and anaerobic treatment - industrial waste water treatment - heavy metal pollution - hard water - softening - purification of water for drinking purposes - water treatment for industrial use -

electrodialysis - reverse osmosis - other purification methods - chemical speciation of elements.

UNIT – IV

Water Analysis

Color - odor - conductivity - TDS - pH - acidity - alkalinity - chloride - residual chlorine - hardness - trace metal analysis - elemental analysis - ammonia - nitrite - nitrate - fluoride - sulphide - phosphate - phenols - surfactants - BOD - COD - DO - TOC - nondispersive IR spectroscopy - anode stripping - ICP - AES - Chromatography - ion selective electrodes - neutron activation analysis.

UNIT – V

Soil Pollution:

Soil humus - soil fertility - inorganic and organic components in soil - acid - base and ion exchange reactions in soils - micro and macro nutrients - wastes and pollutants in soil - introduction to geochemistry - solid waste management - treatment and recycling soil analysis - radioactive pollution - disposal of radioactive waste.

employability/Entrepreneurship/Skill development

REFERENCES:

1. H. Kaur, Environmental Chemistry, 6th Edn, Pragathi Prakashan, Meerut, 2011.
2. K.H.Mancy and W.,J.Weber Jr. Wiley, Analysis of Industrial Waste Water, Interscience New York, 1971.
3. L.W. Moore and E. A. Moore, Environmental Chemistry, McGraw Hill Publication, New York, 2002.
4. S. M. Khopkar, Environmental Pollution Analysis, New Age International (P) Ltd, 1993.
5. Colid Baird. Environmental Chemistry, W. H. Freemand and Company, 1995.

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC16B	Discipline Specific Elective - I Supramolecular Chemistry	5	0	0	4

Aim:

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- To focuses on non-covalent bonding interactions of molecule.

Objective:

- To explain the chemical reactions and molecular rearrangements of non-covalent bond molecules.
- To forces include hydrogen bonding ,metal coordination, van der waals forces, pi-pi interactions and electrostatic effects.

Outcome:

- Understand the reactivity of non-covalent bonding molecules.
- Develop the interaction and nature of organic solvents to others.

UNIT- I

Definition of supramolecular chemistry: Nature of binding interactions in supramolecular structures: ion-ion, ion-dipole, dipole-dipole, hydrogen bonding, cation- π , anion- π , π - π , and van der Waals interactions.

UNIT -II

Synthesis and structure of crown ethers: lariat ethers, podands, cryptands, spherands, calixarenes, cyclodextrins, cyclophanes, cryptophanes, carcerands and hemicarcerands.

UNIT- III

Host-Guest interactions: pre-organization and complimentarity, lock and key analogy. Binding of cationic, anionic, ion pair and neutral guest molecules. Crystal engineering: role of H-bonding and other weak interactions.

UNIT- IV

Self-assembly molecules: design, synthesis and properties of the molecules, self assembling by H-bonding, metal-ligand interactions and other weak interactions, metallomacrocycles, catenanes, rotaxanes, helicates and knots.

UNIT -V

Molecular devices: molecular electronic devices, molecular wires, molecular rectifiers, molecular switches, molecular logic.

Relevance of supramolecular chemistry to mimic biological systems: cyclodextrins as enzyme mimics, ion channel mimics, supramolecular catalysis.

employability/Entrepreneurship/Skill development

REFERENCES:

1. J. -M. Lehn; Supramolecular Chemistry-Concepts and Perspectives (Wiley-VCH, 1995).
2. D. Beer, P. A. Gale, D. K. Smith; Supramolecular Chemistry (Oxford University Press, 1999)
3. W. Steed and J. L. Atwood; Supramolecular Chemistry (Wiley, 2000)

SEMESTER - II

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC21	Organic Chemistry - II	4	0	0	4

Aim:

- To acquaint students with learning Organic Chemistry

Objective:

- To sensitize students to learn Important components of Organic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- Gaining knowledge about Carbon –Carbon Double bonds
- About rearrangements
- Interpret data from a range of physical techniques to characterise Organic compounds.
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis.

UNIT- I

Addition to Carbon–Carbon Multiple Bonds

Electrophilic and nucleophilic additions, addition to conjugated systems, orientation and reactivity, addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation epoxidation, Michael addition, 1,3 dipolar addition, Diels-Alder reaction.

UNIT- II

Addition to Carbon–Hetero Atom Multiple Bonds

Mechanism and reactivity, Mannich, Stobbe, Darzen-Glycidic ester condensation, Benzoin condensation, Peterson olefination (Silyl Wittig reaction), Strecker synthesis, Wittig, Wittig Horner, Perkin, Thorpe, Ritter, Prins reactions.

UNIT -III

Elimination Reactions

E₁, E₂, E₁CB mechanisms, Orientation of the double bond, Hofmann and Saytzeff rule, competition between elimination and substitution, dehydration and dehydrohalogenation reactions. Stereochemistry of E₂ eliminations in cyclohexane ring systems, mechanism of pyrolytic eliminations, Chugaev reaction and Cope elimination.

UNIT - IV

Molecular Rearrangements

A detailed study of the mechanism of the following rearrangements: Nucleophilic. Electrophilic and Free radical rearrangements-memory effects, Migratory aptitudes,

Pinacol-Pinacolone. Oppener-Wagner-Meerwin, Demyanov, Dienone-Phenol, Favorski, Baeyer-Villiger, Wolff, Stevens and Von-Richter (a few examples in each rearrangement are to be studied), rearrangements involving nitrenes- Hofmann, Curtius, Lossen, and Beckmann.

UNIT –V

Oxidation and Reduction

Study of the following oxidation reaction with mechanism: Oxidation of alcohols by CrO_3 - DMSO. DMSO in combination with DCC; acetic anhydride and oxyl chloride, oxidation of aryl methane, allylic oxidation of olefins, oxidative cleavage of glycols, oxidative cleavage of double bonds by ozonolysis., NBS Oxidation.

Study of the following reduction reactions with mechanism: Reduction of carbonyl compounds by hydrides, selectivity in reduction of 4-ter-butylcyclohexanone using selenides, Clemmenson and Wolff-Kishner reductions, Birch reduction, MPV reduction.

employability/Entrepreneurship/Skill development

References:

1. Advanced Organic Chemistry – Reactions, Mechanisms and Structure, Fourth Edition, Jerry March. John Wiley Sons (1992)
2. Organic Chemistry, Francis A. Carey. Third Edition, The McGraw-Hill Companies. Inc.
3. Organic Chemistry, HJendrickson, Cram and Hammond, Third Edition, McGraw-Hill Book Company.
4. Organic Reactions and Mechanisms, P.S.Kalsi, Second Edition, New Age International Publishers.
5. Stereochemistry – of Carbon Compounds, Ernest L. Eliel.T.M.H Edition, Tata McGraw-Hill Publishing Company.
6. Stereochemistry – Conformation and mechanism. P.S.Kalsi, Wiley Eastern Limited.
7. Stereochemistry and mechanism through solved problems, P.S.Kalsi, Second Edition, New Age international Publishers.
8. Stereochemistry of Organic Compounds D.Nasipuri, New Age International Publishers.
9. Reaction mechanism in Organic Chemistry. S.M.Mukherji and S.P.Singh, Macmillan.
10. Organic Chemistry R.T.Morrison and R.N.Boyd, Prentice-Hall.
11. Principles of Organic Synthesis, R.O.C Nomman, 2nd Edition, Chapman and Hall.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC22	Inorganic Chemistry - II	4	0	0	5

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- .
- Present the results of a practical investigation in a concise manner.
- Recognise Nuclear chemistry and transition Elements

UNIT- I

Nuclear Chemistry:

Radioactive decay and equilibrium, Nuclear reactions; Q value, cross sections, types of reactions, Chemical effects of nuclear transformations; fission and fusion, fusion products and fission yields. Radioactive techniques; tracer technique, neutron activation analysis, counting techniques such as G.M. ionization and proportional counter.

UNIT - II

Chemistry of Non-transition Elements:

General discussion on the properties of the non transition element special features of individual elements; synthesis, properties and structure of their halides and oxides, polymorphism of carbon, phosphorus and sulphur. Synthesis, properties and structure of boranes, carbonates, borazines, silicates carbides, silicones, phosphazenes, sulphur-nitrogen compounds; peroxo compounds of boron, carbon and sulphur; oxy acids of nitrogen, phosphorous, sulphur and halogens, interhalogens pseudohalides and noble gas compounds.

UNIT- III

Chemistry of Transition Elements:

Coordination chemistry of transition metal ions; stability constants of complexes and their determination; stabilization of unusual oxidation states. Stereochemistry of coordination compounds. Ligand field theory, splitting of d-orbital in low-symmetry environments. , John – Teller effect : interpretation of electronic spectra including charge transfer spectra; spectrochemical series , nephelauxetic series Magnetism; Dia, para; ferro- and antiferromagnetism, quenching of orbital angular momentum, spin-orbit coupling,

inorganic reaction mechanisms; substitution reactions, trans effect and electron transfer reactions.

UNIT - IV

Chemistry of Lanthanides and Actinides:

Spectral and magnetic properties ; Use of lanthanide compounds as shift reagents molecules metal clusters, Spin crossover in coordinating Photo chemical reaction of chromium and ruthenium complexes. Fluxional compounds.

UNIT -V

Organometallic Chemistry of Transition Elements:

Synthesis, structure and bonding, organometallic reagents in organic synthesis and in homogeneous catalytic reaction (hydrogenation, hydroformylation, isomerisation and polymerization); pi-acid metal complexes, activation of small molecules by coordination.

employability/Entrepreneurship/Skill development

References:

1. Badie E.Duglas and Danl H.McDaniel. Concepts and Models in Inorganic Chemistry, Indian Edition, 1970, Oxford and IBH Publishing Co., New Delhi.
2. J.D.Lee, A.New Concise Inorganic Chemistry , 4th Edition, ELBS, 1995
3. G.Friedlander, J.W. Kennedy and J.M.Miller, Nuclear and Radiochemistry
4. Keith F.Purchell and John. C.Kotz, Inorganic Chemistry, Saunders Golden Sunburst Series, W.B.Sauners Company, Philadelphia.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edition, John Wiley & Sons, New York
6. W.Kain and B.Schwederski, Bioinorganic Chemistry, Inorganic Elements in the Chemistry of life, John Wiley and Sons, New York.
7. James E.Huheey, Ellen A.Keiter and Richard L.Keitre, Inorganic Chemistry; Principles of Structure and Reactivity, 4th Edition, Addison – Wesley, New York, (Unit – I)
8. Shriver and Atkins, Inorganic Chemistry, III Edition Oxford, 1999, India Gopsons Pvt.Ltd, A – 14 sector Noida.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC23	Physical Chemistry - II	4	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry.

Objective:

- To learn the importance of Physical Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Surface Phenomenon and Spectroscopy.
-

UNIT - I

Surface Phenomena:

Adsorption and free energy reaction at inter –phase-physisorption and chemisorption-potential energy diagram-Lennard –Jones Plot-Langmuir,BET isotherm-Gibbs & Freundlich’s adsorption isotherms.

Role of surfaces in catalysis- Semiconductor catalysis-n and p type surfaces-kinetics of surface reactions involving adsorbed species-Langmuir-Hinshelwood mechanism of bimolecular reaction- Langmuir-Rideal mechanism of biomolecularr reaction- Rideal-Eley mechanism.

UNIT- II

Partition Functions:

Calculation of thermodynamic probability of a system –difference between thermodynamics and statistical probability-definition of micro and macro states – different methods of counting macro states-distinguisable and indistinguishable particles classical statistics-derivation of Maxwell-Boltzman Distribution law.

Transational ,rotational.vibrational,electronic-calculation of enthalpy internal energy,entropy and other thermodynamic functions – applications of partition functions to monoatomic and diatomic molecules.

UNIT - III

Spectroscopy:

Microwave Spectroscopy - Theory of linear, symmetric top and asymmetric top molecules.

IR Spectroscopy - Vibrational spectra- selection rules-harmonic and unharmonic oscillator- (fundamental absorption, first and second overtones, hot bands etc)-rotation, vibration spectra of diatomic molecules-influence of rotation on the spectra of polyatomic molecules- FT- IR spectrometry.

UNIT- IV

Raman Spectroscopy: Raman's effect – elastic and inelastic scattering- selection rules-pure rotational Raman spectra(linear, spherical top, symmetric top and asymmetric top molecules)-vibrational Raman's spectra-polarisation of lights and Raman effect-comparison of IR and Raman spectra –simple molecules-mutual exclusion principle-fermi resonance- Laser Raman's Spectroscopy (LRS).

UNIT-V

Group Theory: Elements of group theory- properties of subgroup –classes –group multiplication table –isomorphism groups –symmetry element and symmetry operations –inter relation among symmetry operation- generations- points group of molecules-matrix representation theory –construction of character tables- reducible and irreducible representations –MOs for systems like ethylene, butadiene, monocyclic and aromatic compounds

employability/Entrepreneurship/Skill development

References:

1. F.A.Cotton ,”Chemical Applications of Group Theory”, 2nd ed., Wiley (1981).
2. R.L.Flowry, Jr,Symmetry Groups –Prentice Hall,New Jersey (1980)
3. B.E.Douglas and C.A.Hollingsworth, Symmetry in bonding and spectra- An Introduction,Academic Press Nal(1985)
4. K.Veera Reddy,” Symmetry and spectroscopy of molecules”, New Age International (p) Limited, Publishers,New Delhi.
5. A.K.Chandra, Introductory quantum Chemistry, 4th ed., Tata McGraw Hill(1994)
6. R.K.Prasad, quantum Chemistry, 2nd ed., New Age International Publishers(2000)
7. S.Glasstone, Introduction to Theoretical Chemistry, Affiliated East-West press
8. C.N.Banwell,Fundamentals of Molecular spectroscopy, Tata McGraw Hill(1993)
9. G.M.Barrow , Introduction to Molecular spectroscopy, International McGraw Hill student edition(1984)
10. R.Chang,Basic principles of spectroscopy, McGraw Hill pub.Limited
11. J.D.GrayBeal, Molecular spectroscopy, McGraw Hill International edition(1988)

12. F.W.Sears "Thermodynamics, Kinetic Theory of gases and statistical mechanics",
2nd ed., Addison Wesley(1972)

13. S.Glasstone,"Theoretical Chemistry", Affiliated East-West press

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC24L	Organic Chemistry Lab - II	0	0	5	3

Aims: The organic laboratory class consists of a series of experiments designed to complete in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to key synthetic techniques and will regularly employ spectroscopic techniques to examine the outcome of experiments.

Objectives: To perform seven experiments that have been divided into 3 topics: Functional group interconversions, carbon-carbon bond formation / enolate chemistry, and electrophilic aromatic substitution. To take part in spectroscopy workshops that will demonstrate further topics in spectroscopy and the use of spectroscopic techniques in the characterisation of organic compounds. To learn new synthetic techniques: distillation under reduced pressure, reactions involving continuous removal of water and preparative chromatography. To gain experience in the identification and characterisation of unknown products using ¹H NMR spectroscopy, ¹³C NMR spectroscopy, IR spectroscopy and mass spectrometry. To introduce the concept of multi-step organic synthesis.

ORGANIC CHEMISTRY LAB – II

Qualitative analysis of Organic Compounds:

Estimation of

- a) Phenol
- b) Aniline
- c) Ketone
- d) Glucose

Preparation of Organic Compounds (Double stage)

- a) p-bromoacetanilide from aniline (acetylation & bromination)
- b) 1,3,5- tribromobenzene from aniline (bromination, diazotization & hydroxylation)
- c) p-nitroaniline from acetanilide (nitration & hydrolysis)
- d) p-aminobenzoic acid from para- nitrotoluene, (oxidation & reduction).

employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC25L	Inorganic Chemistry Lab - II	0	0	5	3

Aims:

The inorganic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture-based part of the course. To equip students with the basic skills and expertise required to carry out careful and precise procedures in the modern practical chemistry laboratory whilst providing experiments that illustrate and support the lecture course. To train students in the art of good scientific report writing and in the use of spectroscopic techniques for the structural elucidation of inorganic compounds. To encourage student to become more aware of the risks and hazards associated with careful laboratory work and to assess risks and methods for minimizing them.

Objectives:

Analytical Experiments:

- (1) To be familiar with the use of pipettes, burettes and analytical balances. To be able to transfer quantitatively liquids and solids.
- (2) To be familiar with the techniques of gravimetric analysis, complexometric titration, colorimetry and atomic absorption spectrometry for the analysis of inorganic compounds.
- (3) To learn about gases in the environment and how to analyse for concentrations of gas components via spectrophotometry and IR spectroscopy. In modern analytical chemistry instrumental methods are replacing traditional titration and gravimetric methods. Nevertheless, a good grasp of the basic techniques is essential in all forms of instrumental analysis.

Among these techniques are:

- (a) the ability to make up a standard solution
- (b) the ability to make careful measurements
- (c) an appreciation of errors and significant figures.

Titrimetry and gravimetry (any two)

A mixture(s) of solution given for estimation.

Cu (V)	AND	Ni (G)
Cu (V)	AND	Zn (G)
Fe (V)	AND	Zn (G)
Zn (V)	AND	Cu (G)
Ca (V)	AND	Ba (G)

Preparation of the following compounds (any three)

Tetramminecopper(II) sulphate
 Potassium trioxalatochromate
 Potassium trioxalatoaluminate
 Trithioureacopper(I) chloride

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC26A	Discipline Specific Elective - II Industrial Chemistry	4	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Industrial Chemistry .

Objective:

- To learn the importance of Industrial Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of industries using Chemicals.

Unit – I

Water conditioning for chemical factories – reuse – methods of conditioning – Demineralisation – Precipitation – Desalting – Industrial and Sewage waste water treatment. Vegetable oils – Refining of edible oils – Solvent extraction – Processing of animal fat – Hydrogenation – Interesterification - Manufacture of soap and detergents . Biodegradability of surfactants – Methods.

Unit – II

Pulp and paper industries – Sulphite, Sulphate, soda, ground wood pulp for paper – Manufacture of paper – Speciality paper – Paper stock – Structural Boards. Plastics – Manufacture – Resin – Manufacturing process – Condensation polymerization – Manufacture of laminates and other derivatives – Hexamethylene tetramine plastics – Vinyl esters.

UNIT – III

Basic ideas – Flow charts – Chemical Conversion – Batch Versus Continuous processing – Design – Chemical Process control and economics – Market evaluation – Plant location – Management for productivity and Creativity – Research & Development and its role in Chemical industries.

Unit – IV

Rubber industries – Natural rubber – Synthetic rubber – Monomer production – Synthetic rubber polymerization – Butadiene – Styrene copolymers – Butadiene acrylonitrile copolymer – Neoprene – Thiokol – Silicon Rubber – Butyl rubber – Urethane rubber – Rubber processing- chemicals – Rubber compounding – Rubber fabrication – Latex compound- reclaimed rubber- Rubber derivatives.

UNIT – V

Industrial and military explosives – Manufacture – Pyrotechniques – Manufacture of safety matches. Colour photography – Theory – material and process – special applications of photography.

employability/Entrepreneurship/Skill development

REFERENCES:

1. Chemical process Industries – Norrish Shreve, R. and Joseph A. Brink Jr. McGraw Hill, Industrial Book Company, London.
2. Production and Properties of Industrial Chemicals – Brain A.C.S Reinhold – New York.
3. Fermentation Industries – Burgh, A., Interscience, New York.
4. Hand Book of Technology and Engineering – Gilbert, J., Van Nostrand Reinhold, London.
5. Rubber Hand Book – Rubber Manufacturers association – New York.
6. Petroleum Products Hand Book, Guthrie V., McGraw Hill, Tokyo.

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC26B	Discipline Specific Elective - II Macromolecules as Engineering Materials	5	0	0	4

Aim:

- To study about the macromolecules as engineering materials in various fields.

Objective:

- To develop the concept and reactivity of macromolecules.

Outcome:

- Develop the knowledge of characterization and its applications of macromolecules.

UNIT - I

Concepts - Small molecules to macromolecules. Definitions and nomenclature. Classification of polymers, types of polymerizations (chain growth, step growth and living), molecular weights and distribution.

UNIT- II

Study on physical methods of determining molecular weights and distribution.

Synthesis of macromolecules – thermodynamics and kinetics of chain polymerization with reference to industrially important polymers such as polyethylene, polypropylene, polystyrene, polyvinyl chloride.

UNIT- III

Thermodynamics and kinetics of step polymerization with reference to specialty polymers such as PET, Nylon, PC, and PU. Step growth polymerizations involving crosslinking (gelation) or formation of insoluble polymer mass. Determination of polymer structure via IR and NMR spectroscopies.

UNIT - IV

Characterization of polymer structure in the solid state – Characteristics of Amorphous and semicrystalline polymers. Viscoelasticity. Glass transition temperature

and elementary theories of glass transition. Rubber elasticity and thermodynamic theory of rubber elasticity.

UNIT -V

Applications – Engineering and specialty polymers, high performance fibres (Kevlar), Composite materials (BMC and SMC), conducting plastics. Polymers for separation science, biomedical devices, electronics and photonics.

employability/Entrepreneurship/Skill development

REFERENCES:

1. Polymer Science and Technology, by Joel R. Fried, Prentice Hall of India Pvt. Ltd. 1999.
2. Textbook of Polymer Science, by Fred W. Billmeyer Jr. Fourth Edition, 1999, Wiley-Interscience, New York.
3. Principle of Polymerization, by George Odian, Fourth Edition, 1999, Wiley-Interscience, New York.
4. Polymer Science, by V. R. Gowarikar, N. V. Viswanathan and S. Jayadev, Halsted Press (John Wiley & Sons), New York.

COURSE CODE	COURSE TITLE	L	T	P	C
19214RMC27	Research Methodology	3	-	-	3

Aim:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

Objective:

To understand the approaches towards and constraints in good research.

To identify various statistical tools used in research methodology

To appreciate and compose the manuscript for publication

To train in basic computational and software skills for research in physical and chemical sciences.

Outcome:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I:

Introduction to Research Methodology

Objectives of research – Types of research – Significance of research. Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT II:

Database and Literature Survey

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Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT III:

Data Analysis and Chemical Packages

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – Normal distribution curve – Statistical treatment of finite samples – t test and F test (ANOVA) co-variance (ANCOVA) correlation and multiple regression analysis – Chemical Packages – ChemDraw – ChemSketch – ISIS draw – Origin.

UNIT IV:

Thesis and Paper writing

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

UNIT V:

Laboratory Safety

Basic laboratory guidelines – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers. Laboratory injuries and treatment. Chemical spills – Mercury and Biohazardous – clean up procedure - Accident management - Disposal of chemicals and glass wares.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.
6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill
7. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi

SEMESTER - III

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC31	Organic Chemistry - III	5	0	0	4

Aim:

- To acquaint students with learning Organic Chemistry

Objective:

- To sensitize students to learn Important components of Organic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- Gaining knowledge organic Synthesis.

Unit I

Reagents in Organic Synthesis:

Use of the following reagents in organic synthesis and functional group transformations, complex metal hydrides, Gilman's reagent, lithium dimethylcuprate, lithium diazopropylamine (LDA), 1,3-dithiane, trimethylsilyl iodide, tri-n-butyltin hydride, Woodward and Prevost hydroxylation, osmium tetroxide, DDQ, selenium dioxide, Peterson's synthesis, Wilkinson's catalyst, baker yeast.

Unit II

Photochemistry:

Cis-trans isomerism, Paterno-Buchi reaction, Norrish type I and II reactions. Photoreduction of ketones, di-pimethane rearrangement, photochemistry of arenes.

Unit III

Pericyclic Reactions:

Selection rules and stereochemistry of electrocyclic reactions, cycloaddition, and sigmatropic shifts, Sommet, Hauser, Cope and Claisen rearrangements.

Unit IV

Selective Organic Name Reactions:

Favorski, Mannich, Stork-Enamine reactions, Sharpless asymmetric epoxidation, Ene reaction, Barton reaction, Hoffmann-Löffler-Freytag reaction, Shapiro, Chichibabin and Bayer-Villiger reactions.

Unit V

Spectroscopy:

Applications of Mass, UV-VIS, IR and NMR spectroscopy for structural elucidation of organic molecules.

employability/Entrepreneurship/Skill development

References:

- (1) R.K. Bansal, Organic reaction mechanisms, New Age International, 1996.
- (2) F.A. Carey and R.J. Sunberg, Advanced Organic Chemistry.
- (3) W. Carruthers, Some Modern Methods in Organic Synthesis, Cambridge, 1971.
- (4) E.J. Corey, Reactions and Reagents in Organic Synthesis, VCH, 1988.
- (5) I.L.Finar, Organic Chemistry, Vol. II, ELBS, 1977.
- (6) C. H. Depuy and O.S. Chapman, Elements of Organic Photochemistry, Prentice Hall, 1975.
- (7) D. Dyer, Application of Absorption Spectroscopy of Organic Compounds, Prentice Hall, 1978.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC32	Inorganic Chemistry - III	5	0	0	4

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- Recognise Analytical Techniques and Spectroscopy.

UNIT – I

Topics in Analytical Chemistry:

Adsorption partition, exclusion electrochromatography, solvent extraction and ion exchange methods. Application of atomic and molecular absorption and emission spectroscopy in quantitative analysis. Light scattering techniques including nephelometry. Raman Spectroscopy: Electroanalytical techniques; voltammetry, cyclic voltammetry, polarography, amperometry coulometry and conductometry. Ion-selective electrodes, anodic stripping voltammetry, TGA, DTA, DSC and online analyzer.

UNIT –II

Electronic Spectroscopy:

Electronic configuration, terms states and microstates, derivation of term symbols (p^2 , d^2) and arranging the various terms according to their energies. Spectroscopic terms – effect of inter electronic repulsion and spin – orbit coupling – Racah parameters B and C- R-S coupling and JJ coupling. Selection rules and the breakdown of selection rules- group theoretical explanation. Ground states of free ions for d^n systems- Oh and Td

systems and the corresponding energy level diagrams- mixing of orbitals. Orgel diagram – characteristics – prediction and assignment of transitions for dⁿ weak field cases. Tanabe-Sugano diagrams- characteristics – prediction and assignment of transition for weak field and strong field – dⁿ systems band intensity, band widths – band shapes – factors affecting these – distortion and spin-orbit coupling calculation of B and 10q for simple octahedral complexes of Co and Ni.

UNIT – III

IR and Raman Spectroscopy:

Combined uses of IR and Raman spectroscopy in the structural elucidation of simple molecules like H₂O, ClF₃, NO₃, ClO₃. Effect of coordination on ligand vibrations – uses of group vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate nitrate, sulphate and dimethylsulphoxide. Effect of isotopic substitution on the vibrational spectra of molecules – vibrational spectra of metal carbonyls with reference to the nature of bonding, geometry and number of C-O stretching vibrations (group theoretical treatment).

UNIT – IV

NMR Spectroscopy:

Chemical shifts and coupling constants (spin-spin coupling involving different nuclei ¹H, ³¹P & ¹³C) interpretation and applications to inorganic compounds. Effects of Quadrupole nuclei (¹H, ¹⁰B, ¹¹B) on the ¹H NMR spectrum. NMR paramagnetic molecules - isotopic shifts, contact and pseudocontact interactions- lanthanide shift reagents. Stereochemistry of non-rigid molecules, satellite spectra – Applications of ³¹P, ¹³C and ¹H NMR of inorganic molecules.

UNIT – V

EPR Spectroscopy:

Basic principles – characteristics of 'g' – hyperfine splitting - selection rules- hyperfine splitting on various structure – bis (salicyldiamine)copper(II) – factors affecting the magnitude of the 'g' values of transition metal ions – dependence on spin – orbit coupling crystal field. Three conditions (i) spin-orbit coupling crystal field (ii) strength of the crystal field effects, (iii) very large crystal field. Ni(II) octahedral complex- Cu²⁺ in a tetragonal – field. Zero-field splitting and signal- effecting spins mixing of saturated zero field splitting. Line widths in solid state EPR – spin – lattice – spin – spin relaxation – exchange processes. Effect of distortion – T, A_g, E_g. ground terms – g (parallel), g (perpendicular), g (average) $\alpha^2\beta^2$ and G parameters from EPR and information obtained from them.

References:

1. A.I. Vogel, Quantitative Inorganic Analysis, 3rd Ed., ELBS Longman, London.
2. R.S. Drago, Physical Methods in Inorganic Chemistry, 3rd ed., Wiley Eastern Company.
3. R.S Drago, Physical Methods in Chemistry, W.B. Saunders Company, Thinadelphia, London.
4. P.J. Wheatley, The Determination of Molecular Structure.
5. E.A.V. Ebsworth, Structural Methods in Inorganic Chemistry, 3rd Ed., ELBS, Great Britain, 1987.
6. C.N. Banwell, Fundamentals of Molecular Spectroscopy, 3rd Ed., Mc-Graw Hill, 1983, New Delhi.
7. G.H.H. Stout and L.H. Jenson, X-ray Structure Determination, a Practical Guide.
8. G. Barrow, Introduction to Molecular Spectroscopy, Mc-Graw Hill, New York, 1964
9. P.K. Ghosh, Introduction to Photoelectron Spectroscopy, John Wiley, New York (1989).
10. W.Kemp, NMR in Chemistry – A Multinuclear Introduction, McMillan, 1986.
11. C.D. Becker, High Resolution NMR – Theory and Applications, Academic Press, 2nd Ed., 1980.

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC34L	Physical Chemistry Lab -I	0	0	5	3

Aims: The physical laboratory class consists of a series of experiments designed to be completed in either one or two sessions. The laboratory is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to a number of spectroscopic and analytical techniques.

Objectives: To perform eight experiments covering analytical chemistry, catalysis, diffraction, IR spectroscopy, kinetics and thermodynamics

1. Kinetics – Acid hydrolysis of Esters - Comparison of strengths of acids.

2. Kinetics – Acid hydrolysis of Esters – Determination of Energy of Activation (E_a)

3. Kinetics – Saponification of Ester - Determination of Energy of Activation (E_a) by conductometry

4. Kinetics – Persulphate – Iodine Reaction - Determination of order, effect of ionic strength on rate constant

5. Distribution Law – Study of Iodine – Iodide equilibrium

6. Distribution law – Study of Association of Benzoic acid in Benzene.

7. Adsorption – Oxalic acid / Acetic acid on charcoal using Freundlich

Isotherm.

8. Conductometry –Determination of dissociation constant of weak acids

9. Acid - alkali titrations

10. Displacement titrations

11. Precipitation titrations

12. Solubility product of sparingly soluble silver salts.

employability/Entrepreneurship/Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC35L	Physical Chemistry Lab -II	0	0	5	3

Aims: The physical laboratory class consists of a series of experiments designed to be completed in either one or two sessions. The laboratory is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to a number of spectroscopic and analytical techniques.

Objectives: To perform eight experiments covering analytical chemistry, catalysis, diffraction, IR spectroscopy, kinetics and thermodynamics

1. Determination of molecular weight of substances by cryoscopy

2. Determination of molecular weight of substances by Transition Temperature method

3. Determination of molecular weight of substances by Rast method

4. Determination of Critical Solution Temperature (CST) of phenol – water system and effect of impurity on CST

5. Study of phase diagram of two components forming simple eutectic

6. Study of phase diagram of two components forming a compound.

7. Study of phase Diagram of three components (Acetic acid, Benzene and water)

8. Potentiometric titration's –Acid alkali titration

9. Precipitation titration's

10. Redox titration's

11. Determination of dissociation constant of weak acids.

12. Determination of solubility of silver salts

13. Determination of activity and activity co-efficient of ions

employability/Entrepreneurship/Skill development

References:

1. Finlays "Practical physical chemistry" Revised and edited by B.pLevitt 9th ed, London 1985
2. J.N.Gurtur and R.Kapoor, 'Advanced Experimental Chemistry' Vol.1. Chand & co Ltd., New Delhi

Course Code	Course Title	L	T	P	C
19111OEC	Open Elective - Journalism	4	0	0	2

Aim:

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements, Ethics of Journalism, Press

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters, Qualities, types

UNIT- IV

The Editor and the Sub Editor-qualities, types, editorial department,

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials, articles, middle, features, column

References:-

Journalism	-Susan
Professional Journalism	- John Hogenberg
News Writing and Reporting	- M.James Neal (Surjeet Publication)
Professional Journalism	-M.V Komath
The Journalist's Handbook	-M.V Komath
Mass Communication & Journalism	- D.S Mehta

Course code	Course Title	L	T	P	C
19112OEC	Open Elective: Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, “Operations Research”

Course Code	Course Title	L	T	P	C
19113GEC	Open Elective- Instrumentation	4	0	0	2

Aim:

- Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.
- A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data. Understand that there are finite limits to our ability to make good measurements, and why.

Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

- Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges : AC bridges – Maxwell, Owen, Schering and De Sauty’s bridges – Wien bridges.

UNIT – II: Electronic Instruments – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: Electronic Instruments – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Books for Reference:

A Course In Electrical And Electronic Measurements and Instrumentation – A.K. Sawhmey – Dhanpat Rai and Sons – 1990.

Electronic Measurements And Instrumentation – Oliver Cage – McGraw Hill –1975.

Course Code	Course Title	L	T	P	C
19114OEC	Open Elective-Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislative aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection.

Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	L	T	P	C
19117OEC	Open Elective-Mushroom Technology	4	0	0	2

Aim:

- Mushrooms represent microbial technology that recycles agricultural residues into food and manure
- Mushroom technological interventions aims to increase productivity, quality, and income of farmers through cultivation of mushrooms.

Objectives:

- To strengthen the promotion of mushroom cultivation by establishing a well-equipped laboratory and offices
- To provide the Unit with appropriately trained personnel for the promotion of mushroom production in the country
- To increase the production and consumption of mushrooms.

Outcomes:

- Light. Mushrooms cannot extract nutrients from the sun as green plants do, so they do not need light.
- Cultivating specialty mushrooms is the most accessible way to growing edible mushrooms for profit. The two most popular specialty mushrooms grown in the United States are shiitake and oyster.

Unit – I

Introduction – history – scope of edible mushroom cultivation – Types of edible mushroom available in India – *Calacybeindica*, *VolvariellaVolvacea*, *Pleurotussp.*, *Agaricusbisporus*

Unit – II

Pure culture – preparation of media (PDA and Oatmeal agar media) sterilization – Preparation of test tube slants to store mother culture – culturing of Pleurotus mycelium on petriplates – Preparation of mother spawn in saline bottle and polypropylene bags and their multiplication.

Unit – III

Cultivation Technology : Infra structure, Substrates (locally available) polythene bag, vessels, Inoculation hood – inoculation loop – low cost stove – sieves – Culture rack mushroom unit (Thatched house) – Mushroom bed preparation – Paddy straw, sugarcane trash, maize straw, banana leaves.

Unit – IV

Storage and nutrition : Short term storage – Long term storage (scanning, Pickles, papads, drying, storage in salt solutions) – Nutrition : Proteins, amino acids, mineral elements. Nutrition : Carbohydrates – Crude fiber content, vitamins.

Unit – V

Food preparation, Types of foods prepared from mushroom - soup, cutlet, omelette, samosa, pickles, curry. Research Centres – National level and Regional Level Cost benefit ratio – Marketing in India and abroad – Export value

Reference:

1. Marimuthu et al., (1991) Oyster Mushrooms, Dept. of Plant pathology, TNAU, Coimbatore.
2. Nita Bahl (1988) Hand book of Mushrooms, II edition, Vol.I& II.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.
5. Swaminathan M. (1990) Food and Nutrition, Bappco. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

Course Code	Course Title	L	T	P	C
19120OEC	Open Elective -Web Technology	4	0	0	2

Aim:

- To equip the students with basic programming skill in Web Designing

Objective:

- To understand and practice mark up languages
- To learn Style Sheet and Frames

Outcomes:

- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages

UNIT I

Introduction to the Internet – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

Reference Book

Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
19122OEC	Open Elective- E-Commerce and its Application	4	0	0	2

Aim:

- To organize and promote the exchange of information on communication protocols and information exchange mechanisms for Electronic Commerce.

Objectives:

- To be aware of all aspects of communication and information exchange in Electronic Commerce, including:
 - Navigation, brokerage, advertising and catalogue exchange in pre-sales activities.
 - Negotiation and contract making protocols in interactions between consumers, businesses, and public administration.
 - Secure exchange of documents, content and value in open trading protocols.
 - Communication platforms for the e-Economy, including e-commerce, e-business and e-government.

Outcomes:

- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government

UNIT-I:

History of E-commerce and Indian Business Context: Early Business Information Interchange Effort - Emergence of the Internet-Emergence of the world wide web – The milestones – Advantages of E-Commerce- Disadvantages of E-commerce-Online Extension of a BAM model- Transition to E-commerce in India- The internet and India TELCO-Managing Supply chain on the Internet- Hindustan Lever – Getting the E-advantage – Asian paints – E-transforming the organization - CRISIL – Cost – Effective

distribution channels – ICICI Bank – Comprehensive Transactions – E-transition challenges for Indian Corporate – The Information Technology Act,2000 – ITC’S echoupal Business Models for E-Commerce: E-business models based on the Relationship of Transaction parties- E-business model base on the relationship of transaction types.

UNIT-II:

Enabling Technologies of the World Wide Web: Internet client – Server Application – Networks and Internets –Software agents – Internet Service Provider – Broadband Technologies – Hypertext –Java Script – XML.

UNIT- III:

E-Marketing: Traditional Marketing – Identifying web presence Goals –The Browsing Behaviour model – online marketing – E-advertising – Internet Marketing Trends – Target Markets – E-branding – Marketing strategies – The Times of India.

UNIT-IV:

E-Security: Information system security-security on the Internet-E-Business risk Management issues-Information security environment in India.

UNIT-V

E-payment Systems: E-Banking at ICICI bank-Main concerns in internet baking-History’s lesson about payments: People drive change-digital payment requirements-digital token-based E-payment systems-classification of new payment system-properties of electronic cash(E-cash)-check payment system on the Internet-risk and E-payment system-Designing E-payment system-digital signature-online financial service in India-online stack trading: The high speed alternative.

Reference Book:

“E-Commerce: An Indian Perspective” P.T.Joseph, S.J. Third Edition.

Course Code	Course Title	L	T	P	C
19161OEC	Open Elective – Indirect Taxes	4	0	0	2

Aim:

- To acquaint with the knowledge of indirect taxes

Objectives:

- To make the students to gain expert knowledge in indirect taxes.
- To have practical knowledge on excise duties and customs duties.
- To learn the fundamentals of service tax, sales tax and VATS.

Outcome

- Students gained knowledge of various provisions of central excise customs law, service tax, VAT and sales tax and their applications in different circumstance.

UNIT – I

Objectives of Taxation - contribution to Government revenue- cannons of Taxation – Tax system in India – Direct and Indirect taxes Advantages and Disadvantages of Indirect taxes.

UNIT – II

Central Excise Duty – Meaning - Levy and collection - Distinction between Excise duty and Customs Duty and Sales Tax. Types of excise duties Methods of Levying Excise Duty – Excise and small scale Industries – Excise and Exports.

UNIT – III

Customs Duty – Levy and collection of customs duty Different types of customs Duties – Prohibition on importation and exportation of goods. Exemptions from customs duty.

UNIT – IV

Service Tax – Growth of Service sector – Meaning of Service Tax – Elements of Service Tax- exempted services from tax - Value of taxable services-Different services on which tax is payable.

UNIT – V

Value Added Tax (VAT)

Meaning of VAT, Justification of VAT – VAT and Sales Tax Advantages and Disadvantages of VAT. Methods of Calculating VAT Levy of VAT and Types of VAT.

Reference Books:

Income Tax Law and Practice - N.Hariharan.

Business Taxation – T.S.Reddy/Hari Prasad Reddy.

SEMESTER – IV

COURSE CODE	COURSE TITLE	L	T	P	C
19214SEC33	Physical Chemistry - III	5	1	0	5

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry.

Objective:

- To learn the importance of Physical Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Electro Chemistry.
- Learning various concepts of Quantum Chemistry.
- Learning various concepts of Thermodynamics

UNIT –I

Electrochemistry:

Electrochemical cell reactions, Nernst equation, electrode kinetics, electrical double layer, electrode /electrolyte interface, batteries-primary & secondary fuel cells, corrosion and corrosion prevention.

UNIT –II

Non-Equilibrium Thermodynamics:

Postulates and methodologies, linear laws, Gibbs equation, Onsagar reciprocal theory.

Ideal and Non-Ideal Solutions:

Excess functions, activities, concept of hydration number, activities in electrolytic solutions, mean ionic activity coefficient, Debye-Huckel treatment of dilute electrolyte solutions.

UNIT –III

Quantum Chemistry:

Planck's quantum theory, wave-particle duality, uncertainty principle, operators and commutation relations, postulates of quantum mechanics, free particle, particle in a box, degeneracy harmonic oscillator, rigid rotator and the hydrogen atom. Angular momentum, including spin coupling of angular momenta including spin-orbit coupling.

UNIT –IV

Born-Oppenheimer Approximation:

Hydrogen molecule ion, LCAO-MO and VB treatments of the hydrogen molecule, electron density, forces, and their role in chemical binding. Hybridization and valence MOs of H₂O, NH₃ and CH₄. Huckel pi-electron theory and its applications to ethylene, butadiene and benzene, idea of self-consistent fields.

UNIT –V

Statistical Thermodynamics:

Thermodynamic probability, and entropy , Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, partition function, rotational, translational, vibrational and electronic partition functions for diatomic molecules, calculations of thermodynamic functions and equilibrium constants. Theories of specific heat for solids.

employability/Entrepreneurship/Skill development

REFERENCES:

1. K.Veera Reddy, Symmetry and Spectroscopy of Molecules, New Age International(P) Ltd., Publishers, New Delhi.
2. A.K.Chandra, Introductory Quantum Chemistry, 4th Edn., Tata Mc-Graw Hill(1994)
3. R.K.Prasad, Quantum Chemistry, 2nd Edn., New Age International Publishers(2000)
4. I.N.Levine , Quantum Chemistry, 4th Edn., Prentice Hall of India(1994)
5. D.A.McQuarrie, Quantum Chemistry, University Science Books (1998).
6. P.W.Atkins, Molecular Quantum Mechanics, Clarendon(1973)
7. S.Glasstone, Introduction to Theoretical Chemistry, Affiliated East-West press
8. C.N.Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill(1993)
9. G.M.Barrow , Introduction to Molecular Spectroscopy, International Mc-Graw Hill student edition(1984)
10. B.P Straughan and S.Walker, Spectroscopy, Champon Hall, London
11. F.W.Sears, Thermodynamics, Kinetic Theory of Gases and Statistical Mechanics, 2nd Edn., Addison Wesley(1972)
12. S.Glasstone, Theoretical Chemistry, Affiliated East-West press
13. Lee,Sears and Turcotte, Statistical Thermodynamics Addison Wesley(1974)
14. S.Glasstone, Text Book Of Physical chemistry ,Macmillan(1969)
15. G.C.Bond, Heterogeneous Catalysis-Principles and applications Clarendon(1974)
16. J.C.Kuriacose and Rajaram, Kinetics and Mechanism of Chemical Transformation, Mac-Millan & Co.,(1993)

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC41A	Discipline Specific Elective - III Medicinal Chemistry	5	1	0	4

Aim:

- The aim of this course is to provide a core for future studies and aspects of Medicinal Chemistry.

Objective:

- To learn the importance of Medicinal Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Drugs.
- Learning various concepts in medicinal Chemistry.

General Introduction

Introduction to medicinal chemistry, general mechanism of drug action on lipids, carbohydrates, proteins and nucleic acids, drug metabolism and inactivation, receptor structure and sites, drug discovery development, design and delivery systems, gene therapy and drug resistance.

UNIT - II

Drugs

Drugs based on structure or pharmacological basis with examples, synthesis of important drugs such as α - methyl dopa, chloramphenicol, griseofulvin, cephalosporins and nystatin. Molecular modeling, conformational analysis, qualitative and quantitative structure activity relationships.

UNIT - III

Antibiotics

Mechanism of action of lactam antibiotics and non lactam antibiotics, antiviral agents, chemistry, stereochemistry, biosynthesis and degradation of penicillins - An account of semisynthetic penicillins - acid resistant, penicillinase resistant and broad spectrum semisynthetic penicillins.

UNIT- IV

DNA Interactions

DNA-protein interaction and DNA-drug interaction. Introduction to rational approach to drug design, physical and chemical factors associated with biological activities, mechanism of drug action.

UNIT V

Enzyme Reactions: Nomenclature and classification of enzymes, Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots.

employability/Entrepreneurship/Skill development

References:

1. G. L. Patrick, Introduction to Medicinal Chemistry, Oxford University Press, 2001.
2. I. Wilson, Giswald and F. Doerge, Text Book of Organic Medicinal and Pharmaceutical Chemistry, J.B. Lippincott Company, Philadelphia, 1971.
3. A. Burger, Medicinal Chemistry, Wiley Interscience, New York, Vol. I and II, 1970.
4. Bentley and Driver's Text Book of Pharmaceutical Chemistry revised by L.M. Artherden, Oxford University Press, London, 1977.
5. A. Gringauz, Introduction to Medicinal Chemistry, How Drugs Act and Why?, John Wiley and Sons, 1997.

COURSE CODE	COURSE TITLE	L	T	P	C
19214DSC41B	Discipline Specific Elective - III Green Organic Synthesis: Principles and Applications	5	0	0	4

Aim:

- To develop the study about green organic synthesis and its principles.

Objective:

- To explain the awareness about soil and water pollution in environment.

Outcome:

- Develop the advanced techniques to reduce chemical waste pollution.

UNIT- I

Green Chemistry: Definition, need for Green chemistry, evolution of Green Chemistry, principles of Green Chemistry.

UNIT - II

Classification of organic reactions under Green chemistry principles: a) Atom economic and non-toxic byproduct reactions: rearrangements, addition reaction, condensations, cascade strategies under catalysis, b) atom uneconomic reactions: substitutions, eliminations, Wittig reactions, degradation reactions.

UNIT - III

Green Strategies and techniques for Organic Synthesis: use of Microwave, Sonochemistry, Ball mill technique, electrochemical reactions, photochemical reactions.

UNIT- IV

Catalysis: Principles of various catalysis techniques in terms of Green Organic Synthesis i) Homogeneous, ii) Heterogeneous, iii) bio (enzyme) catalysis, iv) catalysis with nontoxic metals (Ca, Fe, Co, etc.), v) solid supported catalysis, vi) metal free/organocatalysis, vii) Visible light catalysis viii) phase transfer catalysis
Alternative/Green Solvents for Organic Synthesis i) Water, ii) Ionic liquids, iii) Supercritical liquids (SCL), iv) Poly(ethylene glycol) (PEG), v) Fluorous biphasic Solvents.

UNIT- V

Comparison of greenness of solvents. Understanding the role/effect of these solvents on organic reactions. Solvent Free Organic Synthesis. Reactions at Room Temperature, Applications of the Green strategies in Organic Synthesis. Comparing organic reactions under classical conditions and Green conditions.

employability/Entrepreneurship/Skill development

REFERENCES:

1. Green Chemistry: An introductory text by Mike Lancaster, RSC publishing, 2nd Edition, 2010.
2. Green Chemistry: Theory and Practice by Paul T. Anastas and John C. Warner, Oxford University Press, Oxford, 1998.
3. Green Chemistry: Environment Friendly Alternatives by Rashmi Sanghi and M M Srivastava, Narosa Publishing House, Delhi, 2003.

1.1.3 Total number of courses having focus on employability/ entrepreneurship/ skill development offered by the University during the year



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

SCHOOL OF ARTS AND SCIENCE

Department of Microbiology

B.Sc. Microbiology Syllabus

[Regulation 2020]

Skill development	
Employability	
Entrepreneurship	
Employability/Entrepreneurship/Skill development	



School of Arts and Science
Department of Microbiology
B. Sc., Syllabus-Regulation 2020

Bachelor of Science in Microbiology

Our curriculum is intended to educate our majors in a diversity of significant microbiological disciplines, as well as to inspire and improve Language and communicative skills and capabilities that take persistent value beyond the teaching space.

B. Sc Graduate Attributes

- Research, inquiry and analytical thinking abilities.
- Capability and motivation for intellectual development.
- Ethical, social and professional understanding.
- Communication in intra and inter disciplinary
- Teamwork, collaborative and management skills in scientific research
- Information literacy in respective discipline

Educational Objectives-PEO

- PEO1-To gain and apply knowledge of microorganisms concept to solve the problems.
- PEO2-To identify, analyze and understand the problems related to microbes.
- PEO3-Ability to design and develop solutions to the environment using the microbes.
- PEO4-Ability to design performs experiments, analyze, and interpret data for investigating complex problems.
- PEO5-To decide and apply appropriate tools and techniques for manipulations.

Programme Specific Outcomes (PSOs)

- PSO –Expose input practical skills/competencies in working through microbes for study and use in the laboratory as well as outside, with the use of good microbiological practices.

- PSO – obtain information and understanding of the microbiology perception as appropriate to various areas such as medical, industrial, environment, genetics, agriculture, food and others.
- PSO- proficient enough to use microbiology knowledge and skills to study problems involving microbes, clear these with peers/ team members/ other stakeholders, and undertake remedial measures/ studies etc.
- PSO - Developed a broader standpoint of the regulation of Microbiology to facilitate individual to identify challenging societal troubles and plan their professional career to build up novel decision for such problems

B. Sc Programme Outcome-PO

- PO1-Vital Thinking: Able to acquire knowledgeable actions and give the impression of being at our thoughts and assessments (academic, organizational and individual) from diverse perception.
- PO2-Precious communication: Able to speak, read, write and listen noticeably in person and throughout electronic media in English and in one Indian language and build meaning of the globe by connecting people, thoughts books, media and technology.
- PO3-Effectual citizenship: Able to reveal empathetic social concern and fairness centred national progress and the capability to act with and take part in civic life through volunteering
- PO4- Ethics: Be aware of diverse value systems including the individual, under the ethical dimensions of personal choice, and believe responsibility for them.
- PO5- Environment and Sustainability: Able to analyze the importance of microbes for environmental clean-up and sustainable development.
- PO6- Self directed and life-long learning: Able to gain the talent to employ in self-determining and life-long learning in the broadest circumstance socio technological transforms.
- PO7- Economic liberty and employability potential: Attain the ability to be concerned in economically sustainable opening and pound entrepreneurial skill.



**SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY**

**B. Sc., MICROBIOLOGY
REGULATION 2020
COURSE STRUCTURE**

SEMESTER I						
Course Code	Course Title	L	T	P	C	
THEORY						
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I	4	0	0	2	
20111AEC12	English-I	4	0	0	2	
20116AEC13	Fundamentals of Microbiology	6	1	0	5	
20115AEC14B	Bio Chemistry I	6	1	0	4	
PRACTICAL						
20116AEC15L	Fundamentals of Microbiology Lab	0	0	3	2	
20115AEC16BL	Bio Chemistry I Lab	0	0	3	2	
AUDIT COURSE						
201ACLSICN	Indian Constitution	-	-	-	2	
201ACLSUHV	Universal Human Values	-	-	-	2	
	Total	20	2	6	17	
SEMESTER – II						
Course Code	Course Title	L	T	P	C	
THEORY						

20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
20111AEC22	English-II	4	0	0	2
20116AEC23	Microbial Physiology	6	1	0	5
20115AEC24	Bio Chemistry II	6	1	0	4
PRACTICAL					
20116AEC25L	Microbial Physiology Lab	0	0	3	2
20115AEC26L	Bio Chemistry II Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20116RLC27	Research Led Seminar	-	-	-	1
AUDIT COURSES					
201ACLSCOS	Communication Skills	-	-	-	2
201ACSSBBE	Basic Behavioral Etiquette	-	-	-	2
	Total	20	2	6	18
SEMESTER – III					
Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20111AEC31/ 20132AEC31/ 20135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
20111AEC32	English-III	4	0	0	2
20116AEC33	Immunology	4	1	0	4
20116AEC34	Cell Biology	4	1	0	5
PRACTICAL					
20116AEC35L	Immunology Lab	0	0	3	2
20116AEC36L	Cell Biology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20116RMC37	Research Methodology	2	0	0	2
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2
	Total	18	2	6	19
SEMESTER – IV					
Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20116AEC43	Virology	4	1	0	4

20116AEC44	Biostatistics and Bioinformatics	5	1	0	5
201ENSTU45	Environmental studies	2	0	0	2
PRACTICAL					
20116AEC46L	Virology Lab	0	0	3	2
20116AEC47L	Biostatistics and Bioinformatics Lab	0	0	3	2
	Total	19	2	6	19
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	2
SEMESTER – V					
Course Code	Course Title	L	T	P	C
THEORY					
20116AEC51	Food and Dairy Microbiology	4	1	0	4
20116AEC52	Molecular Biology	4	1	0	3
20116AEC53	Agricultural and Environmental Microbiology	4	1	0	4
20116DSC54	Discipline Specific Elective -I	4	1	0	3
PRACTICAL					
20116AEC55L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	2
20116AEC56L	Agricultural and Environmental Microbiology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20116BRC57	Participation in Bounded Research	-	-	-	1
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2
	Total	16	4	6	19
SEMESTER – VI					
Course Code	Course Title	L	T	P	C
THEORY					
20116AEC61	Industrial Microbiology	4	1	0	4
20116SEC62	Clinical Microbiology	4	1	0	5
20116DSC63	Discipline Specific Elective - II	4	1	0	3
201—OEC (2 DIGIT COURSE Name)	Open Elective	4	0	0	2
PRACTICAL					
20116AEC64L	Industrial Microbiology Lab	0	0	3	2
20116SEC65L	Clinical Microbiology Lab	0	0	3	2
20116PRW66	Project Work	-	-	-	4
20116PROEE	Program Exit Examination	-	-	-	1
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2
201ACLSCET	Community Engagement	-	-	-	1
	Total	16	3	6	23

Total Credits -Programme	115
Total Credits - Audit Courses	19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 20116DSC54A – Bioinoculants b) 20116DSC54B –Bioremediation practices c) 20116DSC54C- Molecular Immunology d)20116DSC54D- Algae Biotechnology
	Discipline Specific Elective Courses-I
VI	a) 20116DSC63A - Bioethics b) 20116DSC63B – Biomolecules c) 20116DSC63C – Microbiome d)20116DSC64D – Tissue Culture e)20116DSC64E – Nanotechnology

Open Electives

Semester	Open Elective Courses
VI	a) 201TNOEC-Tamil Ilakkiya Varalaru b) 201ENOEC-Journalism c) 201MAOEC-Development of Mathematical Skills d) 201PHOEC-Instrumentation e) 201CEOEC-Food and Adulteration f) 201CSOEC – E-Learning g) 201CAOEC-Web Technology h) 201CMOEC-Banking service

Credit Distribution

Sem	AE C	SE C	DSC	OE C	Researc h	Others	Total
I	17	-	-	-	-	-	17
II	17	-	-	-	1	-	18
III	17	-	-	-	2	-	19
IV	17	-	-	-	-	2	19
V	15	-	3	-	1	-	19
VI	6	7	3	2	4	1	23
Total	89	7	6	2	8	3	115

SEMESTER I

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம்- வல்லம், தஞ்சாவூர்

பாட குறியாடு :

தமிழ் முதல் பருவம்

முதலாம் ஆண்டு

இக்கால இலக்கியம் - செய்யுள், சிறுகதை , நாடகம், இலக்கிய வரலாறு

அலகு : 1.செய்யுள்

1. தாயுமானவ சுவாமிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்
2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்
3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்
4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்
5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள் ,தமிழ் இனிமை , தமிழ் உணவு

அலகு : 2. செய்யுள்:

6. நாமக்கல் கவிஞர் - தமிழ் தேன் - தமிழ் வளர்க்க சபதம் செய்வோம் , 40 அடிகள்
7. ந.பிச்சமூர்த்தி - வழித்துணை - கவிதை கருடன் , 42 அடிகள்
- 8.சுரதா - தேன்மழை, கலப்பை , 22 அடிகள்
9. கண்ணதாசன் - இலக்கியம் , ஒரு பாணையின் கதை , 54 அடிகள்
10. அப்துல் ரகுமான் - சொந்த சிறகுகள், குப்பையை கிளறும் சிறகுகள், 80 அடிகள்

அலகு : 3. சிறுகதை :

11. சு.சமுத்திரம் - வேரில் பழுத்த பலா

அலகு : 4. நாடகம் :

12. கு. வெ. பாலசுப்பிரமணியன் , கௌதம புத்தர் (உரைநடை நாடகம்)

அலகு : 5. இலக்கிய வரலாறு

13. சிறுகதை , புதினம், நாடகம் உரைநடை , கவிதை , புதுக்கவிதை

Course Code	Course Title	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To enhance vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Learn to edit and do proof reading
- Read and comprehend literature

UNIT – I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Comparison and contrast

Cause and effect

UNIT – IV

Editing

Proof reading

UNIT – V

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

Reference book:

Author	Title of the book	Edition / Year	Publisher
Wren and Martin	English Grammar	2009	S.Chand & Company Ltd
Meenakshi Raman & Sangeetha Sharma	Technical Communication	Second Edition 2011	Oxford University Press
Sudhir Kumar Sharma	The World's Great Speeches	-	Galaxy Publishers

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature
- Appreciate the different types of poetry and prose

UNIT –I

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT – II

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –III

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT –IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world ‘The Hindu’

UNIT –V

Oliver Twist -Charles Dickens

Text book:

Author	Title of the book	Edition / Year	Publisher
S.Murugesan/ Dr.K.Chellappan	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

Course Code	Course Title	L	T	P	C
20116AEC13	Fundamentals of Microbiology	6	1	0	5

Aim

- To impart the basic principles and applications of microorganism

Objectives

- To provide a essential informations of microorganism for progressive and applied reforms in biological sciences for human welfare

Out Comes

CO1 – To Describe the characteristics of microorganisms and classification

CO2 – To Understand the concepts of growth and reproduction of microbes

CO3 – To explain the beneficial and detrimental effects of microorganisms

CO4 - To Gather theoretical background of microbial cultivation

Unit – I

Introduction – definition, scope and history of microbiology, differences between the prokaryotic and eukaryotic microorganisms. Classification of microorganisms – general principles and nomenclature – Haeckel’s three kingdom concept, Whittaker’s five kingdom concept – Classification and characterization of bacteria according to Bergey’s manual of Systematic Bacteriology. Basic understanding of classification of viruses, algae, fungi and protozoa.

Unit – II

Microscopy: Principles and application of simple, compound, bright field, dark field, phase contrast, fluorescent and Electron microscopy. Principles of staining: Nature of dyes, types of staining – simple, differential, negative and spore staining. Sterilization: Principles and methods – physical and chemical.

Unit – III

General characteristics and nature of archacbacteria, Eubacteria, Cyanobacteria, Rickettsiae, Chlamydiae, Spirochaetes, Actinomycetes, Protozoa, Viruses including phages, Mycoplasmas, Algae and fungi.

Unit – IV

Microbial Cell: Ultrastructure of bacteria, subcellular structures and cell envelope – slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane – Biomembrane, liposomes – membrane transport – diffusion, active and passive transport and osmoregulation

Unit – V

Culture techniques: types of media simple, defined, enriched and transport media with specific examples for each type. Methods of maintenance and preservation of cultures

Text book:

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork

Reference Book:

1. Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London.
2. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20115AEC14B	Bio Chemistry I	6	1	0	4

Aim

- To provide the basics of biochemistry and its application.

Objectives

- It serves as good research techniques and the ability to combine and analyze information.

Outcomes

CO1 – To Develop fundamental knowledge about various biomolecules

CO2 - To Understand the basic concepts related to enzymes

CO3 - To Know various biochemical pathway

CO4 - To Understand the concept of microbial metabolism.

Unit I

Carbohydrates: Definition, Classification and Properties; Structural Elucidation of Glucose and fructose; Biological Functions of Glucose, fructose, starch, Cellulose, Chitin and Heparin.

Unit II

Amino acids: Structure, Classification, Properties.

Peptides: Amides and Peptides, Peptide bond, Peptide synthesis, Biologically important Peptides.

Proteins: Biological importance, Classification, properties; Structural orders; Protein stability; Separation and purification of proteins.

Unit III

Nucleotides and Polynucleotides; Terminology –Components.DNA and RNA – Composition, Structure, their biological importance.

Unit IV

Lipids: Biological Significance, Classification of lipids. Analysis of oils – Iodine Number, Saponification Value, Acid number, Acetyl value and Reichert-Meisel value; Qualitative Tests for Lipids.

Unit V

Vitamins: Source, Structure of Biological Role requirement, deficiency manifestation of fat soluble (A, D, E and K) and water soluble (B complexes and C) vitamins.

References:

- Fundamentals of Biochemistry – O.P.Agarwal
- Essentials of Biochemistry – M.C.Pant
- Essentials of Biochemistry – A.J.Jain
- Principles of Biochemistry – Lehninger.
- Text book of Biochemistry – West & Todd.
- Harper's Biochemistry , 25th edn., McGraw Hill.

Course Code	Course Title	L	T	P	C
20116AEC15L	Fundamentals of Microbiology Lab	0	0	3	2

Aim

- To understand the basic principles of Microbiology laboratory.

Objectives

- Microbiology laboratory guidelines and necessary equipment
- Isolation methods for microorganisms.
- Various staining techniques for the observation of microbes.

Outcomes

CO1 – To Develop basic skills in aseptic techniques formicrobiology practical.

CO2 – To gain Hands on experience in handling ofvarious important instruments.

CO3 - Able to perform basic experiments to grow and study microorganism in laboratory

CO4 - To Develop knowledge on identification of microorganisms.

- Microscope and its operation
- Cleaning of glassware's and sterilization methods – autoclaving and hot air oven
- Preparation of culture media
- Experimental demonstration of ubiquitous nature of microorganisms.
- Quantitative estimation of microorganisms.
- Observation of permanent slides to study the structural characteristics of algae(*Anabaena*, *Nostoc*, *Scytonema*, *Spirulina*, *Oscillatoria*.) Fungi (*Pythium*, *Rhizopus*, *Saccharomyces*, *Penicillium*, *Aspergillus*, *Agricus*) and protozoa (*Entamoeba hystolytica* and *Plasmodium* Spp)
- Isolation of microorganisms from soil, water and air.
- Test for motility of bacteria – Hanging drop method and semi solid media inoculation
- Staining techniques – simple staining. Gram's staining, Spore staining, Capsular staining

Course Code	Course Title	L	T	P	C
20115AEC16BL	Bio Chemistry I Lab	0	0	3	2

Aim

- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

- To familiarize the students with the basic cellular processes at molecular level

Outcomes

CO1 - To gain Practical knowledge about various techniques used in Biochemistry

CO2 - To Exhibit the well practical knowledge about estimation of carbohydrates, protein.

CO3 – To Learn the quantitative and qualitative estimation biochemical analysis.

- Qualitative Analysis of Carbohydrate.
- Qualitative Analysis of Proteins.
- Colour Reactions for Amino Acids.

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

Objectives:

1. To make the students understand about the democratic rule and parliamentary administration
 2. To appreciate the salient features of the Indian constitution
 3. To know the fundamental rights and constitutional remedies
 4. To make familiar with powers and positions of the union executive, union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Outcome

- CO1- To gain Democratic values and citizenship Training
- CO2- To know the Awareness on fundamental Rights are established
- CO3- To learn the functions of union Government and State Government
- CO4- To learn the Power and functions of the Judiciary thoroughly
- CO5- To learn the Appreciation of Democratic Parliamentary Rule

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.
- 3) Markandan. k.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore

- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Casestudies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Casestudies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

SEMESTER II

Course Code	Course Title	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

தமிழ் இரண்டாம் பருவம்
முதலாம் ஆண்டு

செய்யுள் , பக்தி இலக்கியம், சிற்றிலக்கியம் , இலக்கிய வரலாறு

அலகு : 1. செய்யுள்:

1. திருஞானசம்பந்தர் தேவாரம் - கோளறு பதிகம்
2. திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை
3. சுந்தரர் தேவாரம் - திருநொடித் தான் மலை
4. மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2 . செய்யுள்:

5. குலசேகராழ்வார் - பெருமாள் திருமொழி
6. நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்
7. ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
8. திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3 . செய்யுள்:

9. திருமூலர் - மூன்றாம் திருமுறை
10. குமரகுருபரர் - மானாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்
11. திரிகூடராசப்பக்கவிராயர் - குற்றாலக்குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்
12. வீரமாமுனிவர் - திருக்காவலூர்க் கலம்பகம்

அலகு : 4 . புதினம்

13. கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5 . இலக்கிய வரலாறு

14. சைவ வைணவ இலக்கியங்கள் , சிற்றிலக்கியங்கள் , (பள்ளு - பிள்ளைத்தமிழ் , - பரணி)

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To know the impact of the biographies of famous people

Outcome:

- Develop technological skill
- Able to write in a variety of formats
- Read biographies and develop personality

UNIT –I

E-mail

Fax

Memos

UNIT – II

Itinerary

Checklist

UNIT – III

Invitation

Circular

UNIT – IV

Instruction

Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

Text Book

Author	Title of the book	Edition / Year	Publisher
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Rajendra Pal & J.S.Korlahalli	Business Communication	2015	Sultan

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Enhance language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology	-A.K. Ramanujan
Gift	-Alice Walker
The First Meeting	-Sujata Bhatt

UNIT –II

Fueled	-Marcie Hans
Asleep	-Ernst Jandl
Buying and selling	-Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival	- Chief Seattle
My Wood	- E.M.Forster
The Meeting of Races	- Rabindranath Tagore

UNIT – IV

The Refugee	-K.A. Abbas
I Have a Dream	-Martin Luther king
Those People Next Door	-A.G. Gardiner

UNIT – V

Marriage is a private Affair	-Chinua Achebe
The Fortune Teller	-Karel Capek
Proposal	-Anton Chekov

Text book:

Author	Title of the book	Edition / Year	Publisher
Gowri Sivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

Course Code	Course Title	L	T	P	C
20116AEC23	Microbial Physiology	6	1	0	5

Aim

- To instruct the importance of microbial metabolism and energetics for regulation and application of microbes in industry.

Objectives

- To understand the microbial growth and nutritional requirements.
- Studying the comprehensive awareness on metabolic process involved in prokaryotic and eukaryotic microorganisms.

Outcomes

CO1- To Determining the growth features of the microbes with various environmental factors.

CO2– To Analysis the essential nutrients ensuring microbial growth.

CO3 - To understand the significance of microbial surveillance

CO4- To know the Electron transport and metabolic pathway of living systems

Unit – I

Nutrition and growth of microorganisms: Nutritional types of microorganisms, nutritional requirements. Factors influencing the growth of microorganisms temperature, pH, Osmotic pressure, moisture, radiations and different chemicals. Physiology of growth – significance of various phases of growth - Growth Measurements – batch, continuous and synchronous

Unit – II

Enzymes and co –enzymes: classification and nomenclature of enzymes, active site, Lock and key Mechanism and induced fit hypothesis, Enzyme kinetics- negative and positive co-operatively, enzyme inhibition: Reversible – Competitive, Noncompetitive, uncompetitive, Irreversible inhibition.

Unit – III

Metabolism of carbohydrates: Anabolism – photosynthesis – oxygenic –anoxygenic, synthesis of carbohydrate – catabolism of glucose – Embden Mayer – Hoff – Parnas

pathway – Pentose pathway, Kreb’s cycle (TCA) – electron transport system and ATP production.

Unit – IV

Metabolism of protein – metabolic pathways of nitrogen utilization (urea cycle), synthesis of amino acids, peptides, proteins

Unit – V

Anaerobic – Respiration and fermentations. Anabolic and catabolic processes of lipids - Reproductive physiology of microorganisms.

Text Book:

S. No	Author Name	Title of the Book	Edition/year	Publisher
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork

Reference Book:

1. Holt J.S., Krieg N.R., Sneath P.H.A and Williams S.T.(1994). Bergey’s Manual of Determinative Bacteriology(9th Edition) – Williams & Wilkins, Baltimore.
2. Brige E.A.(1992) Modern Microbiology – Wm.C. Brown Publishers, Deubque, USA
3. Goodfellow M. and O’Dennell A.C.(1994) Chemical methods of prokaryote systematic – John Wiley & Sons, New York
4. Murray R.K., Cranner M.D., Mayea P.A. and Rodwell V.W.(1990). Biochemistry-prentice Hall International Inc., London
5. Bryant D.A. (1994). The molecular Biology of Cyan Bacteria – Khrwer Academic Publisher, London.

Course Code	Course Title	L	T	P	C
20115AEC24	Bio Chemistry II	6	1	0	4

Aim

- To provide the basic of biochemistry and its application.

Objectives

- It serves as good research techniques and the ability to combine and analyze information.

Outcomes

CO1- To Develop a very good understanding of various biomolecules

CO2 - To gain knowledge about lipids and fatty acids

CO3- To gain knowledge about multifarious function of proteins

CO4- To understand about metabolism.

Unit I

Organization of Life. Water – Physical Properties, Structure of Water, Weak Interactions in aqueous environment; Role of Water in life.

Bioenergetics – Laws of thermodynamics; Free energy concepts; ATP and ADP cycles; ATP as energy currency of cells.

Unit II

Release of energy into cells - Major metabolic pathways – Glycolysis, TCA cycle, Glycogenolysis, Gluconeogenesis, Fatty acid oxidation, ETC and Oxidative phosphorylation.

Unit III

Composition and functions of plant and bacterial cell wall. Biological membrane – Fluid mosaic model; Transport across membranes. Phytohormones – Auxin, Gibberlin and cytokinin.

Unit IV

Cell and cell organelles – Structure and functions of cell organelles – Nucleus, Mitochondria, Chloroplast - Photosynthesis, Golgi apparatus, Endoplasmic reticulum and Micro bodies.

Unit V

Enzymes – Classification, Nomenclature, Mechanism of enzyme action; factors influencing enzyme action – pH and Temperature; Specific activity; MM equation and its significances.

References:

- Principles of Biochemistry – Lehninger.
- Cell Biology – DeRobertis and DeRobertis
- Cell Biology – Rastogi
- Cell Biology – C.B.Powar.
- Biophysical Chemistry – Principles and techniques – Upadhayay, Upadhyay and Nath.
- Principles and techniques of practical Biochemistry – Wilson & Walker.

Course Code	Course Title	L	T	P	C
20116AEC25L	Microbial Physiology Lab	0	0	3	2

Aim

- To study the nutritional requirement of microbes.

Objectives

- To study the growth pattern of bacteria
- To test the biochemical characterization of microbes.

Outcomes

CO1- To Understand and predict the various metabolic reactions in microbial cell.

CO2- To Predict the intermediate products which can be employed in industrial production.

CO3- To know the Environmental growth kinetics of microorganism.

- Bacterial culture / isolation techniques, a streaking method, b. Pour plate method
- Isolation and cultivation of fungi
- Bacterial growth curve: cell count / viable count / absorbance (total count)
- Carbohydrate fermentation test:
 - Glucose
 - Lactose,
 - Maltose
 - Sucrose
 - Mannitol
- Biochemical test for identification of Bacteria:
 - Indole test
 - Methyl red
 - Voges – Proskaur test
 - Citrate utilization
 - TSI agar test
 - Urease
 - Catalase
 - Oxidase

Text Books:

- Pelezar Jr. M.J. Chan E.C.S. and Kroig N.R.(1993). Microbiology – Mcgraw Hill Inc., New York
- Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London
Pelczar, Jr. M.J.
- Bucker, J.M. Caldwell, G.A., Zachgo, E.A. 1990. A Laboratory Course, Academic Press
- Harold J.Benson, 1994. Microbial Applications, W.M.C. Brown Publishers

Course Code	Course Title	L	T	P	C
20115AEC26L	Bio Chemistry II Lab	0	0	3	2

Aim

- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

- To familiarize the students with the basic cellular processes at molecular level

Outcomes

CO1- To demonstrate an understanding of fundamental biochemical principles

CO2-To learn the structure/function of biomolecules, metabolic pathways, and regulation

CO3- Students are able to make buffers, study enzyme kinetics

1. Estimation of reducing sugar by Benedict's Quantitative Method.
2. Estimation of Ascorbic acid by Titrimetric Method.
3. Estimation of Amino Acid by Formal Titration.
4. Estimation of RNA by Orcinol Method.
5. Estimation of DNA by Diphenylamine method.
6. Determination of Acid Number of edible oil.
7. Separation of amino acids by paper chromatography.
8. Separation of amino acids by TLC.
9. Separation of plant pigments by column chromatography.

References:

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer

Course Code	Course Title	L	T	P	C
20116RLC27	Research Led Seminar	-	-	-	1

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text

- ii. Identify the purpose of the text
- iii. Identify the context of the text
- iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office

- iii. Excel
- iv. Powerpoint

Unit VI

- Introduction to social mediawebsites
- Advantages of socialmedia
- Ethics and etiquettes of socialmedia
- How to use Google searchbetter
- Effective ways of using SocialMedia
- Introduction to DigitalMarketing

Unit VII

- Meaning of non-verbalcommunication
- Introduction to modes of non-verbalcommunication
- Breaking the misbeliefs
- Open and Closed Bodylanguage
- Eye Contact and FacialExpression
- HandGestures
- Do's andDon'ts
- Learning fromexperts
- Activities-BasedLearning

Reference:

1. SenMadhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

SEMESTER – III

Course Code	Course Title	L	T	P	C
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20110AEC31	Tamil-III	4	0	0	2
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தமிழ் மூன்றாம் பருவம்
இரண்டாம் ஆண்டு

செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு

செய்யுள்

அலகு : 1

1. சிலப்பதிகாரம் - மனையறம் படுத்த காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3. சீவக சிந்தாமணி - விமலையார் இலம்பகம்

அலகு :2

4. பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
5. கம்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்

அலகு :3

6. சீறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
7. தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு :4

8. நளவெண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

9. காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

Course Code	Course Title	L	T	P	C
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20111AEC31	Advanced English-III	4	0	0	2
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Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand phonetics
- Develop writing skill
- Able to develop creative writing

UNIT –I

The organs of speech

Classification of speech sounds

Vowels and Diphthongs

UNIT –II

Consonants

Consonant cluster

UNIT – III

Syllable

Word accent

Intonation

UNIT – IV

Idiom

Interpretation of graphics

UNIT – V

Slogan writing

Writing advertisement

Reference books:

Author	Title of the book	Edition / Year	Publisher
T.B. Balasubramaniyan	A text book of Phonetics for Indian Students	Reprint 2008	Macmillian
Meenakshi Sharma & Sangeetha Sharma	Technical Communication	2011	Oxford University Press

Course Code	Course Title	L	T	P	C
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20111AEC32	English-III	4	0	0	2
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Aim:

- To acquaint with learning English through literature

Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – 1

The Doctor's World	- R.K. Narayan
The Postmaster	- Rabindranath Tagore
Princess September	- E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	- Norah Burke
Uneasy Home Coming	- Will F. Jenkins
Resignation	- Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

Text book:

Author	Title of the book	Edition / Year	Publisher
Steuart H.King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One – Act Play		Emerald

Course Code	Course Title	L	T	P	C
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20116AEC33	Immunology	4	1	0	4
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Aim:

- Intended to impart the basic and essential information on immune system.

Objectives

- This course focuses on the concepts of immune system in human body.
- To create awareness on immunity
- To give knowledge on antigen and antibody
- To learn human diseases and vaccine

Outcomes

CO1- To understand theory linked to cells and organs related to immune system.

CO2- Able to know Immune response and immune mechanism.

CO3- To Understand the mechanism of Immunological disorders.

CO4- To Learn the importance and precautions of Immunodeficiency syndromes

Unit I

Introduction- History of immunology-scope of immunology. Immunity and their types- Innate and Acquired immunity, Active and Passive immunity. Immune response- Humoral and Cell mediated immune response.

Unit II

Lymphoid organs- primary and secondary lymphoid organs and their role. Cells of the immune system – Stem cell, Lymphocytes, T and B lymphocytes. Plasma cell, T Helper cell, T suppressor cell, T-cytotoxic cell, Null cells, Killer cell, Macrophages, Blood cells and platelets.

Unit III

Antigen- types, chemical nature and essential factors of antigen, Hapten, Adjuvants, Immunoglobulin - Structure, classes, properties and functions. Antigen- antibody reactions.

Unit IV

Complement- Salient features, complement activation, Classical pathway, Alternative pathway, Biological function of complement system. Major Histocompatibility complex (MHC)- Types and functions.

Unit V

Monoclonal antibodies, Hypersensitivity reactions, Immunoprophylaxis, Vaccines – types, Toxoid and antitoxin, Immunoelectrophoresis, HLA typing, ELISA and RIA

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	Kuby	Immunology	4 th / 2000	W.H. Frumen and Company

Reference Book:

1. Abul. K. Abbas, Andrew H.Lichtman, Jordan S.Pobar 1994. Cellular and Molecular Immunology. II edition. W.B.Saunders, U.S.A.
2. William E.Paul 1993. Fundamental Immunology. II edition, Raven press, New York.
3. Topley & Wilson's 1990. Principles of Bacteriology, Virology and Immunity VIII edition Vol.I General Microbiology and Immunity. Edward Arnold, London.

4. Lesile Hudson, Frank C.Hay, 1989. III edition. Practical Immunology. Blackwell Scientific Publication.
5. Helen Chapel, Mansel Haeney. 1986. Essentials of clinical Immunology . ELBS.
6. Mackett M. and Wiliamson J.D.1995. Human vaccines and vaccination. BIOS Scientific Publishers.
7. Bernard R.Glick and Jack J.Pasternak 1994. Molecular Biotechnology – Principles and Applications of Recombinant DNA. ASM Press, Washington.

Course Code	Course Title	L	T	P	C
20116AEC34	Cell Biology	4	1	0	5

Aim:

- Students will understand the cellular basis of life and their importance.

Objectives:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells

Outcomes:

- To grasp the significance of cell and its components in living systems
- To understand the and describe the structures and basic components of prokaryotic and eukaryotic cells
- To understand the cyclical events of cell division and types of cell division
- To acquire the knowledge of cell biology for understanding various physiological process
- To understand the synthesis of cellular compounds and cell signaling

Unit - I

History of cell biology, cell as basic unit of life, cell theory, protoplasm theory and organismal theory, broad classification of cell types, Bacteria, Archaea (prokaryotic) and eukaryotic cells and their similarities and differences.

Unit - II

Cell Organelles- Nucleus, Endoplasmic Reticulum(link is external), Golgi Apparatus, Mitochondria(link is external), Chloroplast(link is external), Lysosome, Peroxisome – Protein Sorting & Transport – Cytoskeleton(link is external) & Cell Movement – The Plasma Membrane

Unit - III

Biogenesis of Cellular organelles – Biosynthesis of mitochondria, chloroplast, ER, Golgi complex; Biosynthetic process in ER and golgi apparatus; Protein synthesis and folding in the cytoplasm; Degradation of cellular components.

Unit - IV

Cell cycle - An overview of cell cycle; Components of cell cycle control system; Intracellular and Extra-cellular control of cell division, Programmed cell death (Apoptosis), intrinsic & extrinsic pathways of cell death, Apoptosis in relation with Cancer and Viral disease

Unit - V

Cell communication – overview – types of cell signaling – signal molecules – signal amplification – receptor types – quorum sensing.

REFERENCES

- Verma P.S. and Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules, Molecular Biology), Paperback, S. Chand and Company Ltd.
- Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, 6th Edn, 2015, Garland Science
- The Cell, A Molecular Approach(link is external) – 6th Edition – Geoffrey M.Cooper/Robert E.Hausman- Sinauer Associates, Inc.

Course Code	Course Title	L	T	P	C
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20116AEC35L	Immunology Lab	0	0	3	2
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Aim

- To learn the immunological techniques in disease diagnosis.

Objectives

- Acquire knowledge on antigen antibody reactions.
- Studying the immunology tests and their interpretations.

Outcomes

CO1- Able to know about principles and techniques Blood grouping
 CO2- To Understand the immunological experiments for clinical field
 CO3- To know the methods of Counting of RBC, WBC and platelets

Lab work

- ABO Blood Grouping
- Rh typing
- WIDAL Test
- White Blood Cell Count
- Red Blood Cell Count
- Antigen preparation
- Radial Immunodiffusion
- Double Immunodiffusion
- Demonstration of ELISA
- Demonstration of RIA

References

- O’Gorman, Manrice RG and Albert David Donnenberg. Hand book of human Immunology. Boca Raton, FL: CRC press, Francis.2008.
- Rajan S and Selvi Christy R. Experiments in Microbiology. Anjana Books House, Chennai. 2015.

Course Code	Course Title	L	T	P	C
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20116AEC36L	Cell Biology Lab	0	0	3	2
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Aim:

- Students will understand the cellular basis of life and their importance.

Objectives:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells

Outcomes:

- To grasp the significance of cell and its components in living systems
- To understand the and describe the structures and basic components of prokaryotic and eukaryotic cells
- To understand the cyclical events of cell division and types of cell division

1. Separation of nucleic acid bases by paper chromatography
2. Mitosis in onion root
3. Meiosis in flower bud
4. Normal human karyotyping
5. preparation of polytene chromosome
6. Isolation of chloroplast from spinach leaves
7. Isolation of protoplast
8. Life cycle of Drosophila
9. Culture of Human, Plant & Animal cells
10. Identification and study of cancer cells- Slides/Photomicrographs

REFERENCE:

- Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.
- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley & Sons. Inc.

Course Code	Course Title	L	T	P	C
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20116RMC37	Research Methodology	2	0	0	2
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Aim:

To create a basic appreciation towards research process and awareness of various research publication

Objectives:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

Outcomes:

CO1- To Understand research questions and tools

CO2- To gain Experience in scientific writings

CO3- To Practice in various aspects of scientific publications

CO4- To understand Inculcation of research ethics

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V:

Basic Principles of Laboratory Safety and Waste management

Introduction - Access to Laboratory and Emergency Exits - Personal Protective Clothing and Equipment - Good Working Practices-Maintenance of Laboratory Equipment - Working with Hazardous Substances - Storage of Chemicals - Working with Flammable Solvents - Gas Cylinders-Fire Precautions - Emergency Procedures - First Aid - Accident Follow-Up - Safety Manual - Safety Training - Management of Laboratory Safety and Responsibilities - Waste Management.

Course Code	Course Title	L	T	P	C
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201ACLSOAN	OFFICE AUTOMATION	-	-	-	2
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Aim:

Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with the internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

SEMESTER – IV

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தமிழ்.

நான்காம் பருவம்

இரண்டாம் ஆண்டு

செய்யுள் , சங்க இலக்கியம், அற இலக்கியம் , செம்மொழி , இலக்கிய வரலாறு

அலகு . 1 : பண்டைய இலக்கியம் - நற்றிணை;

1. நெய்தல் - தோழி கூற்று - பாடல் எண் . 11
2. குறிஞ்சி - தலைவி கூற்று - பாடல் எண். 64
3. முல்லை - தலைவன் கூற்று - பாடல் எண்.142
4. பாலை - நற்றாய் கூற்று - பாடல் எண். 29
5. மருதம் - தலைவி கூற்று - பாடல் எண். 70

பண்டைய இலக்கியம் குறுந்தொகை

1. குறிஞ்சி - தோழி கூற்று - பாடல் எண்.1
2. முல்லை - செவிலித்தாய் கூற்று - பாடல் எண்.167
3. மருதம் - தலைவி கூற்று - பாடல் எண். 181
4. நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290
5. பாலை - தலைவன் கூற்று - பாடல் எண் . 347

பண்டைய இலக்கியம் ஐங்குறுநூறு

1. மருதம் - கள்வன் பத்து - முதல் இரண்டு பாடல்கள்
2. நெய்தல் - தோழிக்குரைத்த பத்து - முதல் இரண்டு பாடல்கள்
3. குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்
4. பாலை - இளவேனிற் பத்து - முதல் இரண்டு பாடல்கள்
5. முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு . 2 : கலிந்தொகை

1. பாலை - பாடல் எண். 2
2. குறிஞ்சி - பாடல் எண். 37

அகநானூறு

1. பாலை - பாடல் எண். 5

2. மருதம் - பாடல் எண். 6

புறநானூறு

பாடல் எண் : 6 ,121, 41, 153 ,172 191, 223, 246, 284, 358.

பதிற்றுப்பத்து

இரண்டாம் பத்து பாடல் எண். 4 (நிலம் நீர் வளி விசும்பு)

அலகு.3;

1 . பட்டினப்பாலை - முதல் 105 வரிகள்

2. திருக்குறள் - 1.மருந்து 2.ஊக்கமுடைமை 3.உழவு

அலகு . 4 : செம்மொழி வரனறு ;

(மொழி - விளக்கம் , மொழிக்குடும்பங்கள், உலகச் செம்மொழிகள், இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள், வாழும் தமிழ் செம்மொழி, தொன்மை , தமிழின் சிறப்புகள், தமிழ் செம்மொழி நூல்கள்)

அலகு . 5 : இலக்கிய வரலாறு

சங்க இலக்கியங்கள் , பதினெண்கீழ்க்கணக்கு நூல்கள்.

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop writing skill
- Comprehend and describe poems
- Learn interviewing skills

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation

–Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

Reference books:

Author	Title of the book	Edition / Year	Publisher
Rajendra Pal & J.S Korlahalli	Essentials of Business Communication	2015	Sultan Chand & Sons
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Wren & Martin	English Grammar & Composition	2009	S.Chand

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Objective:

- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Improve their ability to read and understand
- Know the genius of Shakespeare
- Express one's views in writing

UNIT –I

My Last Duchess	-Robert Browning
The Toys	-Coventry Patmore
I, too	-Langston Hughes

UNIT –II

How to be a Doctor	-Stephen Leacock
My Visions for India	-A.P.J. Abdul Kalam
Woman, not the weaker sex	-M.K. Gandhi

UNIT –III

The Best Investment I ever made	-A.J.Cronin
The Verger	-W.S Maugham
A Willing Slave	-R.K.Narayan

UNIT –IV

Macbeth
As You Like It

UNIT –V

Henry IV
Tempest

Text book:

Author	Title of the book	Edition / Year	Publisher
Devaraj	English for Enrichment		Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

Course Code	Course Title	L	T	P	C
20116AEC43	Virology	4	1	0	4

Aim:

- To study the characteristics of viruses and viral infections.

Objectives

- To study general aspects of classification and structure of viruses.
- Study in the viral infections, their diagnosis and treatment strategies.

Outcomes

CO1- To Understand the characteristic features of viruses.

CO2– To Gain the knowledge about the biology of bacteriophages.

CO3– To Learn the range of plant viruses and animal viruses.

CO4 -To know the role of viruses in causing of cancer.

UNIT – I

Introduction – Definition, History of virology. General properties of Viruses classification of Viruses – cultivation of Viruses – Structure and replications Viruses.

UNIT – II

Bacterial Viruses – structure of bacteriophage, The Lytic life cycle (T-Even coliphages) – Lysogenic life cycle (*Escherchia coli*, Phage Lambda) noninteractive lysogeny (*Escheirchia coli*).

UNIT – III

Plant Viruses, Common plant viral diseases: Tobacco Mosaic **Virus** (TMV), Bunchy top of banana, satellite virus. Cucumber Mosaic **Virus** (CMV), Cauliflower Mosaic **Virus** (CaMV). Bacteriophages, Viroids.

UNIT – IV

Animal viruses: Morphology, pathogenesis and laboratory diagnosis of Prions, Animal viruses Rinder pest, Blue tongue, Raniket dion, Foot and Mouth Disease. Human Viruses – Herpes, HIV, Hepatitis Viruses. Viral Vaccines. Prevention and treatment of viral diseases. Antiviral agents.

UNIT - V

Virus: Assay, purification and characterization of Viruses, Separation and characterization of viral components and quantification of Viruses. Immune responses to viruses, Interferon and other cytokines, Antiviral therapy.

Text books:

S. No	Author Name	Title of the Book	Edition/year	Publisher
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1	Nester, E.W, D.G. Anderson, C. Erans Roberts, N.N. Pearsan, M.T. Nester	Introduction Microbiology	4 th / 2004	Mc Graw Hill Hyher Education
1.	R. C. Dubey, D.K. Maheswari	A Text Book of Microbiology	3 rd / 2003	Chand Publishing

Reference Book:

1. Conrat, H.F.Kimball, P.C. and Levy, J.A.(1988). Virology. II Edition. Prentice Hall, Englewood cliff, New Jersey.
2. Harold J.Benson. 1994. Microbiological Applications. Wm.C.Brown Publishers, Melbourne, Australia.
3. James, C.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub. Co. California.

Course Code	Course Title	L	T	P	C
20116AEC44	Biostatistics and Bioinformatics	5	1	0	5

Aim

To introduce the basic knowledge on Biostatistics and Bioinformatics tools and its applications

Objective

- The basic objective is to give students an introduction to the biostatistics and bioinformatics.
- Emphasis will be given to the application of biostatistics, bioinformatics and biological databases to problem solving in real research problems.

Outcome

- To understand the importance of principal concepts about biostatistics
- To know the knowledge about statistics and its relation with other science and research aspects
- To obtain the knowledge on bioinformatics databases, perform text- and sequence-based searches
- To become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems.

Unit I

Concepts in statistics, Types of Data, presentation of data, types of graphics, relative frequency, cumulative frequency, Measurement of central tendency, Measures of variation, coefficient of variation, Measures of Skewness and Kurtosis, Probability and its applications, Laws of Addition and Multiplication, Compound probability, Baye's Theorem.

Unit II

Random Variables and Distributions. Binomial, Poisson, Exponential and Normal Distributions and their applications. Samples and Sampling Distribution, Standard Error, significance level, Degrees of freedom, Tests of significance, tests for proportion, t and F tests Confidence. Correlation: Simple, Partial and Multiple Correlation. Regression Analysis. Analysis of variance for one and two way classification

UNIT III

Biological Databases: Structure, Sequence and literature databases. Protein sequence database - PIR, SWISS-PROT, MIPS. Protein structure database - PDB, SCOP. DNA sequence databases – Gen Bank, ENBL, MBL, DDBJ. Literature data base – Med Line, PubMed. Patterns, motifs and profile Databases: Metabolic Pathway Databases.

UNIT IV

Sequence Alignment and Analysis: Local and Global alignment. Scoring matrices. Database Similarity Searches: BLAST, FASTA, PSI-BLAST algorithms; Pair wise sequence alignment - NEEDLEMAN and Wunsch, Smith Waterman algorithms; Multiple sequence alignments - CLUSTAL, PRAS; Patterns, motifs and Profiles in sequences.

UNIT V

Important parameters in Drug Discovery and the role of computational methods. Process of drug discovery – Target identification, target validation, lead identification, lead optimization and preclinical pharmacology and toxicology. Computer Aided Drug Design (CADD). Molecular docking - Concept of receptor and target. Receptor binding and activation. Ligand-receptor interaction, non-covalent bonds. Ligand into the binding site.

References

Andreas D. Baxevanis And B. F. Francis Ouellette. 2001. **Bioinformatics.**A Practical Guide to the Analysis of Genes and Proteins (Second Edition). John Wiley & Sons, Inc.

Arthur M. LESK, 2003 Introduction to Bioinformatics Oxford University Press

Attwood T. K. And Parry-Smith D. J. 2003. Introduction to Bioinformatics. Pearson Education (Singapore) Pvt. Ltd.

Balasubramanian, D., Bryce, C. F. A., Dharmalingam, K., Green, J. And Kunthala Jayaraman. 1996. Concepts in Biotechnology (Edts.) University Press (India) Ltd.

Basu, O., S.K. Thukral. 2007. Bioinformatics-Databases, Tools and Algorithms. Oxford University Press, New Delhi.

Bryan Bergeron, M.D. 2006. Bioinformatics Computing. 2006. Prentice Hall of India Pvt Limited, New Delhi.

Gautham, N. 2006. Bioinformatics- Databases and Algorithms, Narosa Publishing House Hall of India Pvt. Ltd, New Delhi.

Ignacimuthu, S.S.J. 2005. Basic Bioinformatics, Narosa Publishing House, India.

Lesk, A.M. 2006. Introduction to Bioinformatics. (2nd Edition). Oxford University Press, New Delhi.

Course Code	Course Title	L	T	P	C
201ENSTU45	Environmental studies	2	0	0	2

Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Outcome

CO1- To Understand eco-system

CO2- To Know social issues and the environment

CO3- To Learn keep the environment eco-friendly

1. Nature of Environmental Studies

Definition, scope and importance.

Multidisciplinary nature of environmental studies

Need for public awareness.

2. Natural Resources and Associated Problems.

- Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.
 - Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
 - Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
 - Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.
 - Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
 - Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification,
- Role of an individuals in conservation of natural resources.

3. Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Producers, consumers and decomposers.

Energy flow in the ecosystem.

Ecological succession.

Food chains, food webs and ecological pyramids.

Introduction, types, characteristics features, structure and function of the following ecosystem:

a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.

Bio — geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

India as a mega — diversity nation.

Western Ghat as a biodiversity region.

Hot — spot of biodiversity.

Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

5. Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

6. Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides.

Urban problems related to energy Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issue and possible solutions.

Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.

Environmental Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural / Industrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems — ponds, river, hill slopes, etc.

References:

- 1) Agarwal, K.C, 2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)
- 3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- 4) Clank R.S., Marine Pollution, Clarendon Press Oxford (TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) De A.K., Environmental Chemistry, Wiley Western Ltd.
- 7) Down to Earth, Centre for Science and Environment, New Delhi. (R)
- 8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
- 10) Heywood, V.K. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, V.J. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
- 12) Mickinney, M.L. and School. R.M. 1996, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
- 13) Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).
- 14) Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574zp.
- 15) Rao M.N. and Dana, A.K. 1987, Waste Water Treatment, Wxford & IBH Publ. Co. Pvt. Ltd., 345p
- 16) Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut

- 17) Survey of the Environment, The Hindu (M)
- 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)
- 20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
- 21)Wagner K.D., 1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
- 22) Paryavaran shastra — Gholap T.N,
- 23) Paryavaran Sahastra — Gharapure
(M) Magazine
(R) Reference
(TB) Textbook

Learning Outcomes:

Students who graduate with a major in environmental science will be able to:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
4. Apply their ecological knowledge to illustrate and graph a problem and
5. describe the realities that managers face when dealing with complex issues; and
6. Understand how politics and management have ecological consequences.

Course Code	Course Title	L	T	P	C
20116AEC46L	Virology Lab	0	0	3	2

Aim:

- To study the isolation and cultivation methods for viruses.

Objectives

- Cultivation of viruses and various methods of propagation.

Outcomes

CO1- To Know the structure of plants, animal, bacteria and viruses.

CO2- To grasp the significance of isolation, propagation of various viruses

CO3- To build clinical laboratory testing devices

Lab work

1. Isolation of coliphage from sewage.
2. Determining Bacteriophage Titers
3. Cultivation of viruses in embryonated egg.
4. Chicks Embryo Fibroblast technique for virus cultivation

Demonstrations

1. Isolation of microorganisms from Phyllosphere.
2. Study of the following viral diseases: Tobacco mosaic; Cucumber Mosaic Virus.
3. Demonstrations of some plant, animal & human viruses (photographs, diagram etc.).

Course Code	Course Title	L	T	P	C
20116AEC47L	Biostatistics and Bioinformatics Lab	0	0	3	2

Aim

- To introduce the basic knowledge on Biostatistics and Bioinformatics tools and its applications

Objective

- The basic objective is to give students an introduction to the biostatistics and bioinformatics.
- Emphasis will be given to the application of biostatistics, bioinformatics and biological databases to problem solving in real research problems.

Outcomes

CO1: To Read and learn statistical measures individually.

CO2- To analysis the data from experiments and interpretation of the *results*

CO3- To study the multivariate analysis in biostatistics

CO4 - To understand the nucleotide sequence data of the given species using NCBI / EMBL / DDBJ.

CO5 - To identify the protein sequence of the species using PIR and Swissprot / UniProt

- Mean and Standard deviation using biological samples
- Chi – Square test, Student ‘t’ test and Correlation coefficient
- Regression Coefficient and regression lines
- Pairwise alignment using FASTA, BLAST.
- Multiple alignments using Clustal W.
- Study of internet resources in Bioinformatics – NCBI, ENBL, EBI.

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?

- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Team work
- Negotiation
- Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.

- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul

Kalam - . "A Leader Should Know How to Manage Failure"
<https://www.youtube.com/watch?v=laGZaS4sdeU>

- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

SEMESTER V

Course Code	Course Title	L	T	P	C
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20116AEC51	Food and Dairy Microbiology	4	1	0	4
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Aim:

- To learn the role of microbes in food production, food spoilage and food borne illness.

Objectives

- To learn about factors involved in microbial food spoilage
- Understanding the food preservation methods
- To make aware of food borne diseases

Outcomes

CO1– To identify the role of microorganisms in the production of food

CO2– To know the milk and foods quality test for detecting microorganisms

CO3– To Gain the knowledge regarding food preservation

UNIT – I

Introduction: Importance of food and dairy Microbiology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic).

UNIT – II

Food fermentations: Cheese, bread, wine, fermented vegetables – methods and organisms used. Food and enzymes from microorganisms – single cell protein, production of enzymes.

UNIT – III

Contamination, spoilage and preservation of different kinds of foods, cereals and cereal products – sugar and sugar products – vegetable and fruits – meat and meat products – fish and other sea foods – eggs and poultry – dairy and fermentative products (ice cream/milk/bread/wine).

UNIT – IV

Food Poisoning: food borne infections (a) Bacterial: *Staphylococcal*, *Brucella*, *Bacillus*, *Clostridium*, *Escherichia*, *Salmonella* (b) Fungal: Mycotoxins including aflatoxins, (c) Viral: Hepatitis, (d) Protozoa – Amoebiasis.

UNIT – V

Food preservation: Principles of food preservation – methods of preservation. a. Physical (irradiation, drying, heat processing, chilling and freezing, high pressure and modification of atmosphere) b. Chemical (Sodium benzoate Class I & II). Food Sanitation: Good manufacturing practices – Hazard analysis, Critical control points, Personnel hygiene.

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
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1.	W.C. Frazier, D.C. Westhoff	Food Microbiology	4 th /1988	TATA McGraw Hill Publishing company ltd
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Reference Book:

1. Banwart, G.J.1989. Basic Food Microbiology, Chapman & Hall New York.
2. Board, R.C.1983. A Modern Introduction to Food Microbiology, Blackwell Scientific Publications, Oxford.
3. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.
4. Hobbs, B.C. and Roberts, D.1993. Food Poisiong and Food Hygiene, Edward Arnold (A division of Hodder and Stoughton), London.

Course Code	Course Title	L	T	P	C
20116AEC52	Molecular Biology	4	1	0	3

UNIT – I

Historical and conceptual background - Discovery of DNA as genetic material, Griffith's experiment, Hershey and Chase warring blender experiment, Chargaff's rule. Structures of DNA and RNA: Types of genetic material. DNA Structure: Salient features of double helix, types of DNA. RNA Structure. Denaturation and renaturation, cot curves. DNA topology: linking number, topoisomerases. DNA organization in prokaryotes, viruses, eukaryotes

UNIT – II

DNA replication in prokaryotes: Replicons – models of DNA replication – origin and termination of replication – rolling circle replication – proof for semi conservative replication (Meselson and Stahl Experiment) – enzymes and proteins involved in DNA replication (nucleases, polymerases, ligases, helicases, gyrases, single strand binding protein, replisome and primosome) – mechanism of semi discontinuous replication.

UNIT – III

Transcription: Steps involved in transcription of prokaryotes, promoters, transcription factors, RNA polymerases I, II and III – ribosomal RNA transcription and processing – genetic code, deciphering the genetic code, characteristics of genetic code, Wobble hypothesis, central dogma of life and reversal of central dogma.

UNIT – IV

Translation: Steps involved in translation of prokaryotes – role of proteasomes in protein degradation – mechanism of action of antibiotics on protein synthesis (puromycin, chloramphenicol and streptomycin). Regulation of gene expression in prokaryotes – polycistronic mRNA and operons (lac operon and trp operon and attenuation mechanism).

UNIT – V

Mutation: spontaneous and induced mutations – UV and X - rays – mechanism of action of base analogues, alkylating agents, intercalating agents and teratogens – reversion suppressor mutations and mutation rate – repair of damaged DNA - excision repair, SOS, photoreactivation – CRISPR and their role in genome stability

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	U. Sathyanarayana	Biotechnology	2010	Arunabha Sen Books and Allied (P)Ltd
2	Dr. P. Asokan	Molecular Biology	2006	Chinnaa Publications

3	U. Sathyanarayana	Biotechnology	2010	Arunabha Sen Books and Allied (P)Ltd
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References

1. Maloy SR, Cronan Jr.JE, Freifelder D.1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1992 Nucleic acids and Molecular Biology – Springer – Verlag.
3. Blackburn CM, Gait MJ. 1996. Nucleic acids in Chemistry and Biology – Oxford University Press.
4. Stryer L.1995. Biochemistry. W.H.Freeman and company.
5. Eckstein F, Lilley DM.1996 Catalytic RNA – Springer – Verlag.
6. Friedberg EC, Walker GC, Siede W.1995. DNA repair and Mutagenesis. ASM press.
7. Gardner EJ, Simmons MJ, Snustad DP, 1991. Principles of Genetics. John Wiley & Sons.
8. Singer M, Berg P.1991. Genes and Genomes. University Science Books.

Course Code	Course Title	L	T	P	C
20116AEC53	Agricultural and Environmental Microbiology	4	1	0	4

Aim:

- To learn about microorganisms in the environment and their importance in agriculture.

Objectives

- To know the microbes in various environments like soil, water and air.
- Importance of microbes in agriculture and waste treatment.

Outcome

CO1 - To acquire the information about microbes

CO2 - To Know about microbes and its role in environment.

CO3 - Able to understand about microbes in agriculture and environmental practice.

UNIT – I

Classification of soils. Physical and chemical characteristics and microflora of various soil types. Interactions among microorganisms: Symbiosis – mutualism – commensalisms – competition – amensalism – synergism – parasitism – predation. Biogeochemical cycles. Carbon, nitrogen, phosphorus and sulphur.

UNIT – II

Biofertilizers. Symbiotic nitrogen fixation – (*Rhizobium*, *Frankia*) –Symbiotic nutrient mobilizers – Endomycorrhizae and Ectomycorrhizae – Non symbiotic microbes – *Azotobacter* – *Azospirillum* – Cyanobacteria (*Nostoc*, *Gloeocapsa*, *Anabaena*).

UNIT – III

Microbial Association with higher plants – Rhizosphere – *Rhizobium* – infection – inoculation – nodule formation. Phylloplane association with animals. A brief account of the symptoms, etiology, life-cycle and management of bacterial (blight of paddy, citrus canker) and fungal (late blight of potato and red rot of sugarcane) diseases.

UNIT – IV

Microbiology of air – organisms in air, distribution and sources. Droplet nuclei, aerosol, assessment of air quality. Types of aquatic ecosystems: fresh water – ponds, lakes, streams. Marine habitats – estuaries, mangroves, deepsea, hydrothermal vents, salt pans, coral reefs. Zonations – upwelling – eutrophication – food chain. Potability of water – microbial assessment of water quality – water purification – brief account of water - borne diseases.

UNIT – V

Types of wastes – characterization of solid and liquid wastes. Solid waste treatment – saccharification – gasification – composting, Utilization of solid wastes – food (SCP, mushroom, yeast); fuel (ethanol, methane, hydrogen); fertilizers (composting). Liquid waste treatment. Treatment methods – primary –secondary (anaerobic – methanogenesis; aerobic- trickling activated sludge – oxidation pond – tertiary treatment.

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	K.C. Agarwal	Environmental Biology	1998	Agro Botanica
2.	P. Rajendran, P. Gunasekaran	Microbial Bioremediation	2007	MJP Publishers
3.	R. C. Dubey, D.K. Maheswari	A Text Book of Microbiology	3 rd / 2003	Chand Publishing
4.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork

References

1. Ec Eldowney, S., Hardman, D.J. and Waite, S. 1993. Pollution: Ecology and Biotreatment – Longman Scientific Technical
2. Baker, W.C. and Herson, D.S.1994. Bioremediations – McGraw Hill Inc., New York
3. Ernest, W.C.1982. The Environment of the Deep sea, Vol II, J. G. Morin Rubey.
4. Rheinmer, G.1977. Microbial Ecology of Brackish Water environment: Ecological Studies – Vol-25, Springer – Verlag Nerlin – Heidellberg New York.
5. Norris, J.R and Pettipher, G.L.(1987). Essays in Agricultural and Food Microbiology, John wiley and Sons, Singapore.
6. Harold J.Benson, 1994. Microbiological applications. Wm.C.Brown Publishers, Melbourne, Australia.
7. Burges, A. and Raw, F. 1967. Soil Biology. Academic Press, London.
8. Martin Alexander Wiley. 1961. Introduction to Soil Microbiology. International Edn., New York.
9. Vanghan, D. and Malcolm, R.E.1985. Soil Organic Matter and Biological Activity. Martinus Nighoff W.Junk Publishers.

Course Code	Course Title	L	T	P	C
20116AEC55L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	2

Aim:

- To analyze microbiological quality of food samples.

Objectives

- Microbiological tests used in the food industry.
- To study and characterize the food borne microorganisms.

Outcome

CO1 - To Analyze the microbes in food and dairy industry products

CO2 - To understand the Production methods of Food and dairy products using microbes

CO3 - To gain Knowledge about Molecular Genome analysis and quantification

CO4 - To understand the Isolation of DNA and amplification using PCR technique.

CO5 - To know about Protein and DNA separation technique

Lab work

1. Assessment of milk quality by methylene blue reduction test
2. Wet mount preparation of fungal organism from spoiled bread, tomato, grapes, potato.
3. Observation of food samples to study *Leuconostoc sp.*, *Lactobacillus sp.*, *Streptococcus lacti* and *Saccharomyces*
4. Preparation of yoghurt
5. Determination of thermal death time (TDT) and thermal death point (TIP) of microorganisms from spoiled foods
6. Direct microscopic examination of milk by standard plate count (SPC) method
7. Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
8. Isolation of chromosomal DNA from bacteria by Spectrophotometric assay.
9. Development of competent cells in *E. coli*.
10. Isolation of antibiotic resistant auxotrophic mutants.
11. Protoplast and Spheroplast isolation

Demonstration

1. Fermenting ability of yeast
2. Antibiotic resistance – plasmid mediated – chromosomal mediated – Gel Electrophoretic methods.
3. Principles and applications of agarose gel electrophoresis and plasmid separation in agarose gel.

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
20116DSC54A	Bioinoculants	4	1	0	3

Aim:

- To study the importance of microbes as bioinoculants/biofertilizers.

Objectives

- To give an overview about role of microorganisms for the cycle of carbon, nitrogen, phosphorus and sulphur in the nature with a special focus on agrosystems.
- Importance of microorganisms for agricultural production and commercial composts.

Outcomes

CO1- To acquire knowledge in microbial products

CO2- To know the Separation techniques of primary and secondary metabolites

CO3- To grasp the Applications of value added products

CO4- To know the microbial inoculants in agricultural practices

UNIT – I

General account of the microbes used as a biofertilizers for crop plants and their advantages. Symbiotic N₂ fixers: Rhizobium- Isolation, characterization, identification, classification, inoculum, production and field application. Frankia- Isolation, characterization- actinorrhizal nodules-non-leguminous crop symbiosis.

UNIT – II

Non-symbiotic N₂ fixers-Azospirillum-Free living-Azotobacter-free isolation, characterization, mass inoculum production and field application.

UNIT – III

Symbiotic N₂ fixers- Cyanobacteria, Azolla- Isolation, characterization, mass multiplication- role in rice cultivation- Crop response- field application- immobilization.

UNIT – IV

Phosphate solubilizers- phosphate solubilizing microbes- Isolation, characterization, mass inoculum production, field application- Phosphate solubilization mechanism.

UNIT – V

Mycorrhizal bioinoculants- classification- importance of mycorrhizal Ectomycorrhizae- Endomycorrhizae- Ectendo mycorrhizae- Taxonomy of mycorrhizae- Isolation of VA mycorrhizae- quantification and assessment of VAM in roots- Mass inoculum production VAM- field applications of Ectomycorrhizae and VAM.

Reference:

1. Kannaiyan, S. (2003). Biotechnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth press, Inc. New York.
3. Reddy, S. M. et al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba rao N. S (1995). Soil microorganisms and plant growth. Oxford and IBH publishing co. Pvt. Ltd. New delhi.
5. Subba rao N. S (1998). Biofertilizers in Agriculture and forestry. Oxford and IBH publishing co. Pvt. Ltd. New delhi.

Course Code	Course Title	L	T	P	C
20116DSC54B	Bioremediation practices	5	0	0	4

AIM

To know the basic principles of Bioremediation practices

COURSE OUTCOME :

CO1- Students gain the knowledge about Bioremediation I

CO2- Get the information about Bioremediation – II Solid phase bioremediation

CO3- learn about Hazardous Waste Management

CO4- Learn to the concept of bioremediation

CO5 - To know about Concepts of phytoremediation

Unit I

Bioremediation- I Introduction, constraints and priorities of Bioremediation, Biostimulation of Naturally occurring microbial activities, Bioaugmentation, in situ, ex situ, intrinsic & engineered bioremediation

Unit II

Bioremediation – II Solid phase bioremediation - land farming, prepared beds, soil piles, Phytoremediation. Composting, Bioventing & Biosparging; Liquid phase bioremediation - suspended bioreactors, fixed biofilm reactors.

Unit III

Hazardous Waste Management biotechnology application to hazardous waste management - examples of biotechnological applications to hazardous waste management – cyanide detoxification - detoxification of oxalate, urea etc. - toxic organics -phenols.

Unit IV

Concept of bioremediation (in-situ & ex-situ), Bioremediation of toxic metal ions biosorption and bioaccumulation principles.

Unit V

Concepts of phytoremediation. Microbial leaching of ore-direct and indirect mechanisms. Mining and metal. Use of microorganisms in augmentation of petroleum recovery. Biotechnology-with special reference to Copper and Iron.

References:

1. Environmental Biotechnology by S. K. Agarwal
2. Biodegradation & Bioremediation (1999), Martin Alexander, Academic press.

3. Stanier R. Y., Ingram J.L., Wheelis M.L., Painter R.R., General Microbiology, McMillan Publications, 1989.
4. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd., 1987.
5. Karrely D., Chakrabarty K., Omen G.S., Biotechnology and Biodegradation, Advances in Applied Biotechnology Series, Vol.4, Gulf Publications Co. London, 1989.
6. Bioremediation engineering; design and application 1995 John. T. cookson, Jr. Mc Graw Hill, Inc.
7. Environmental Biotechnology by A.K. Chatterjee 8. Environmental Biotechnology by S.N.Jogdand Himalaya Publishing

Course Code	Course Title	L	T	P	C
20116DSC54C	Molecular Immunology	5	0	0	4

AIM

To know the basic principles of Advanced immunology

COURSE OUTCOME :

CO1- Students gain the knowledge about the Immune system

CO2- Get the information to Immune responses generated by B and T lymphocytes

CO3- Rapidly evolving scientific area into B-cell maturation, activation and differentiation;

CO4- get the knowledge about Antigen-antibody interactions

Unit I

Immunology- fundamental concepts and anatomy of the immune system Components of innate and acquired immunity; Phagocytosis; Complement and Inflammatory responses; Haematopoiesis; Organs and cells of the immune system primary and secondary lymphoid organs; Antigens - immunogens, haptens; Major Histocompatibility Complex - MHC genes, MHC and immune responsiveness and disease susceptibility, HLA typing.

Unit II

Immune responses generated by B and T lymphocytes Immunoglobulins-basic structure, classes and subclasses of immunoglobulins, antigenic determinants; Multigene organization of immunoglobulin genes; B-cell receptor; Immunoglobulin superfamily; Principles of cell signaling; Immunological basis of self – non-self discrimination; Kinetics of immune response, memory.

Unit III

B-cell maturation, activation and differentiation; Generation of antibody diversity; T-cell maturation, activation and differentiation and T-cell receptors; Functional T Cell Subsets; Cell mediated immune responses, ADCC; Cytokines-properties, receptors and therapeutic uses; Antigen processing and presentation- endogenous antigens, exogenous antigens, non-peptide bacterial antigens and super-antigens; Cell-cell co-operation, Hapten-carrier system.

Unit IV

Antigen-antibody interactions Precipitation, agglutination and complement mediated immune reactions; Advanced immunological techniques - RIA, ELISA, Western blotting, ELISPOT assay, immunofluorescence, flow cytometry and immunoelectron microscopy; Surface plasma resonance, Biosensor assays for assessing ligand –receptor interaction, CMI techniques lymphoproliferation assay, Mixed lymphocyte reaction, Cell Cytotoxicity assays, Apoptosis, Microarrays, Transgenic mice, Gene knock outs.

Unit V

Vaccinology Active and passive immunization; Live, killed, attenuated, sub unit vaccines; Vaccine technology- Role and properties of adjuvants, recombinant DNA and protein based vaccines, plant-based vaccines, reverse vaccinology; Peptide vaccines, conjugate vaccines;

Antibody genes and antibody engineering- chimeric and hybrid monoclonal antibodies; Catalytic antibodies and generation of immunoglobulin gene libraries.

References

1. William E. Paul, Fundamental Immunology, Wolters Kluwer/ Lippincott Williams & Wilkins.
2. Stephen K Wikel, The Immunology Host-Ectoparasitic arthropod relationships. Cabinternational.
3. Herman N. Eisen, MD, General Immunology. J.B. Lippincott Company. F.M. Burnet, Immunology. W.H. Freeman and company
4. Jack G. Chirikjian, Plant Biotechnology, Animal cell culture Immunobiotechnology. Jones and Bartlett Publishers.

Course Code	Course Title	L	T	P	C
20116DSC54D	Algae Biotechnology	5	0	0	4

AIM

To know the basic principles of genes and proteins

OBJECTIVES:

To understand the gene functions and its genetic engineering aspects To understand the protein functions and its genetic engineering aspects

COURSE OUTCOME :

CO1- Students gain the knowledge about the algal biotechnology

CO2- Get the information about uses of algae

CO3- Rapidly evolving Algal production systems

CO4- Learn to store various Chemical composition of algae.

UNIT I

Introduction to algal biotechnology: Resource potential of algae; commercial utility of algae. Algae as a source of food and feed; Algae as a source of pigments, fine chemicals, fuel and bio-fertilizers. Distribution of economically important algae in India.

UNIT II

Uses of the following algae: Spirulina, Dunaliella, Haematococcus, Chlorella, Scenedesmus, Botryococcus, Porphyridium, Hypnea, Gracilaria, Gelidium, Gelidiella, Kappaphycus, Grateloupia, Sargassum, Turbinaria, Cystoseira, Laminaria, Macrocystis, Porphyra, Caulerpa and Ulva.

UNIT III

Algal production systems; Strain selection; Algal growth curve; Culture media; indoor cultivation methods and scaling up. Measurement of algal growth. Large-scale cultivation of algae. Evaporation and uniform dispersal of nutrients; Harvesting algae. Drying.

UNIT IV

Chemical composition: protein, amino acids, lipids, waxes, glycerol, vitamins, pigments, chlorophyll, carotenoids and phycobiliproteins. Algal immobilization and its applications; Blue-green algal bio-fertilizer: Method of preparation, application and its advantages over inorganic fertilizers.

UNIT V

Liquid seaweed fertilizer: Method of preparation and application. Biodiesel from algae: algae producing biodiesel; Advantages over other sources of biodiesel; Cultivation and extraction methods. Phycoremediation. Role of algae in nanobiotechnology.

References

1. BARSANTI, LAURA AND PAOLO GUALTIERI 2005 Algae-Anatomy, Biochemistry and Biotechnology. Taylor & Francis, London, New York. BECKER, E.W. 1994
2. Microalgae-Biotechnology and microbiology. Cambridge University Press. CHANDRAMOHAN, D. 2007.

3. Prospects of Biodiesel from marine microorganisms. Proceedings of the National Workshop on BIODIESEL, Organised by School of Energy, Environment & Natural Resources, Madurai Kamaraj University, Madurai and Ahimsa Agri division, Chennai, 17th and 18th October, 2007.
4. TRIVEDI, P.C. 2001 Algal Biotechnology. Pointer publishers, Jaipur, India. VENKATARAMAN, L.V. AND E.W. BECKER 1985.
5. Biotechnology and Utilization of Algae – The Indian Experience. Dept. Science and Technology, New Delhi and Central Food Research Institute, Mysore, India.

Course Code	Course Title	L	T	P	C
20116AEC56L	Agricultural and Environmental Microbiology Lab	0	0	3	2

Aim:

- Understanding the techniques to study the environmental / agriculture microorganisms.

Objectives

- Isolation and characterization of agriculture important microbes.
- To study the environmental microbes and their impact.

Outcome

CO1 - To acquire the information about microbes role in agriculture

CO2 - To Learn about Biofertilizer production

CO3 - To Know about microbes and its role in environment

Lab work

- Isolation and culturing of *Rhizobium* from root nodules.
- Isolation and culturing of *Azospirillum* from grassplant.
- Isolation and culturing of *Azotobacter* from paddy field
- Isolation and culturing of *Phosphobacter* from paddy field
- Isolation and culturing of Blue Green Algae from paddy field
- Isolation and identification of air-borne bio-particles using Open plate method
- Effects of high salt concentration on microbial growth
- Microbial flora of polluted water – Microbial flora of sewage
- Bacterial examination of drinking water by membrane filter technique and MPN

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
 - Difference between a CV, Resume and Bio data
 - Essential components of a good resume
- ii. Resume skills : common errors**
- Common errors people generally make in preparing their resume

- Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

i. Interview Skills : Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

ii. Interview Skills : Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

iii. Interview Skills : Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

SEMESTER VI

Course Code	Course Title	L	T	P	C
20116AEC61	Industrial Microbiology	4	1	0	4

Aim:

- Understanding the industrial importance of microorganisms and their products.

Objectives

- To study the development of industrial microbiology and microbes of industrial prominence.
- To acquire knowledge on design of fermentors and its types.
- Industrial production of various pharmaceutical and commercial products using microbes.

Outcomes

CO1- To understand the vital role of various substrate used in fermentation.

CO2- To Learn the different types of reactors or fermenters.

CO3- To gain knowledge about upstream and downstream processing

Co4 - To acquire the knowledge on different product production

UNIT – I

Historical development of Industrial Microbiology, Industrially important microorganisms, Primary and secondary screening and preservation of industrially important strains. Microbial strains improvement. Primary and secondary metabolites.

UNIT – II

Fermenter: Design, types and basic functions of fermenter. Fermentation media formulation strategies, Essential factors (pH and temperature, incubation), carbon, nitrogen, vitamin and mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams, types of fermentation.

UNIT – III

Downstream processing: Product recovery and purification (intracellular and extracellular), cell disruption, precipitation, filtration, centrifugation, solvent recovery, chromatography, ultrafiltration, drying, Enzyme and cells immobilizations and its applications.

UNIT – IV

Microbial products of pharmaceutical value – raw materials, organism and Industrial processes involved in the production of Pencillin, Streptomycin, Vitamin B12, Riboflavin and rabies vaccine.

UNIT – V

Microbial products of Industrial value – Raw materials, organism and Industrial processes involved in the production of ethanol, vinegar, amylase, protease, glutamic acid. Recycling and safe disposal of Industrial wastes through microbes.

Text Book

1. Stanbury, P.F. Whitaker, A. Hall, S.J. 1995. Principles of Fermentation Technology, Pergamon Press.
2. Sikyta, B. 1983. Methods in Industrial Microbiology, Ellis Horwood Limited.
3. Click, B.R. Pasternak, J.J. 1994. Molecular Biotechnology – ASM Press.

Reference:

1. Demain A.L. Solomon, N.A. 1986. Manual of Industrial Microbiology and Biotechnology. ASM Press
2. Reed. G. 1982. Prescott and Dunn's Industrial Microbiology. Macmillan Publishers.
3. Prave, P. Faust, V, Sitting, W., Sukatsch, DA. 1987. Fundamentals of Biotechnology. ASM Press.
4. Malik V.S. Sridhar, P. 1992. Industrial Biotechnology. Oxford & IBH.
5. Venkataraman, L.V. 1983. A Monograph on Spirulina platensis. CFTRI, Mysore.

Course Code	Course Title	L	T	P	C
20116SEC62	Clinical Microbiology	4	1	0	5

Aim:

- To understand the clinical significance of microorganisms.

Objectives

- To study virulence of pathogenic microbes.
- To understand the pathogenesis and treatment methods of various diseases
- To understand the various diagnostic techniques.

Outcomes

CO1- To Understand the basic and general concepts of Normal flora of the human body

CO2 –To Understand the sources of infectious diseases and transmission

CO3 - To Study the pathogenicity of bacterial, fungal, protozoa and viral diseases

CO4- To Understand the preventive measures of Hospital acquired infections

UNIT – I

Basics in Medical microbiology - Infectious diseases overview. Medically important microbes. Normal microbial flora of the human body, Host-microbe interactions – virulence factors of microbes. Invasiveness and pathogenicity. Immunity of microbial diseases

UNIT – II

Diagnostic Microbiology – collection and transport of specimen for Microbiological examination – General methods for isolation and identification of bacteria. Typing of bacterial isolates. Sero-diagnosis.

UNIT – III

Clinical symptoms. Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following bacterial infections (a) Streptococcal infections, (b) Staphylococcal infections, (c) Meningitis, (d) Tuberculosis, (e) Leprosy, (f) Gastrointestinal disorders – typhoid, cholera, bacillary dysentery, (g) Sexually transmitted diseases – syphilis, gonorrhoea. (h) Anaerobic wound infection – tetanus, gas gangrene.

UNIT – IV

Clinical symptoms. Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following viral infections (a) Respiratory infections, common cold, influenza, measles, mumps and rubella. (b) neurological infection – encephalitis (Dengue, Japanese encephalitis), Rabies (c) Liver diseases : Hepatitis A,B,C,D & E (d) Immunodeficiency diseases, AIDS, CMV (Cytomegaloviruses) Herpes simplex viruses.

UNIT – V

Clinical symptoms. Epidemiology, pathogenesis, laboratory, prevention and treatment of the following fungal and protozoan infections (a) Fungal – superficial, subcutaneous and systemic mycoses, (b) Protozoan: Amoebiasis, Malaria, Leishmaniasis, (c) Helminths – Filariasis, Ascariasis, Zoonotic diseases, Hospital acquired infections.

Text Book

1. Schaechter, M. Medoff, G. and Eisenstein, B.C. (1993). Mechanism of Microbial Diseases. 2nd edition. Williams & Wilkins, Baltimore.
2. J.C. Collee, J.P., Duguid, A. C. Fraser, B.P. and Marimon (1989). Mackie and Mc Carteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.

Reference:

1. Ronald M. Atlas (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
2. E. Joan Stokes, G.L. Ridgway and M.W.D. Wren (1993). Clinical Microbiology. 7th edition. Edward Arnold. A division of Hodder and Stoughton.
3. David Greenwood, Richard C.B. Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14th edition. ELBS with Churchill Livingstone.
4. Hume W.B. and Russell A.D. (1989). Pharmaceutical Microbiology. IV edition. Blackwell Scientific Publications, Oxford.
5. Topley / Wilson's (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol. III Bacterial Diseases, Edward Arnold, London.

Discipline Specific Elective - II

Course Code	Course Title	L	T	P	C
20116DSC63A	Bioethics	4	1	0	3

Aim:

- To recognise and understand ethical concepts in biological research.

Objectives

- Understands and can apply the various theories and principles of bioethics
- Can scrutinise and identify health, administrative and public health policies to identify ethical issues
- Bioethics in medicine and clinical research

Outcomes

CO1- To identify ethical issues in a research proposal

CO2- To Understand the Intellectual property Rights (IPR) and patent filling.

CO3- To gain Knowledge about to ensure ethical conduct of biomedical research

CO4- To Describe the basic concepts of legal, ethical, economic, and regulatory measurements.

UNIT – I

General Ethical concerns: the use of nature, Different views of nature, Dynamic nature, interfering with nature, integrity of species; Reducing genetic diversity; Biological warfare; public perception of science.

UNIT – II

Medical ethics; History and culture: The Hippocratic tradition: a profession, Philanthropy, Do no harm, adoption to the oath by western medicine. Competing ethical Traditions; Retaining the Hippocratic oath.

UNIT – III

Status of Human embryo: Human Embryonic development; Ethics through embryo development: Fertilization, the fetus and feeling pain; Scientific Research on Human Embryos: Experimental goals of Human Embryo Research, Human Development; How much Embryo experimentation in ethical?

UNIT – IV

Animal Rights: Making new strains of animal: Ethical limits of animal use: Religious views of animal status; Philosophical views of animal status; regulations.

UNIT –V

Human Gene therapy: Ethics of somatic cells gene therapy: Efficiency of treatment; safety of transferred genes; protecting human life; Affect on family life; Economic factors; when we should use Gene therapy?

References:

Nancy, S. Jecker., Albert R. Johnson, Robert A. Pearlman. Bioethics: An Introduction to history, methods and practice (1997). Sudbury, M. A. ; Jones and Barlett Publishers.

Tom, L. Beauchamp., childress, F. Principles of biomedical ethics, 5th edition, Oxford University Press. 2000.

Course Code	Course Title	L	T	P	C
20116DSC63B	Biomolecules	4	1	0	3

AIM

To know the functions of Biomolecules

OBJECTIVE :

- To understand the structure and functions of carbohydrates, lipids , proteins and nucleic acids
- To understand the role of nucleic acid in proteins synthesis

OUTCOME

CO1- They acquire knowledge in the quantitative and qualitative estimation of biomolecules

CO2- They study the influence and role of structure in reactivity of biomolecules

CO3- Students have a thorough understanding on the role of biomolecules and their functions.

Unit I

Carbohydrates: Structure and biological functions of Mono, di and Polysaccharides. Types of polysaccharides: Homo polysaccharides -chitin, fructans, mannans, xylans, and galactans. Structure and biological importance of Hetero polysaccharides- Glycoprotein – bacterial cell wall polysaccharides, marine polysaccharides and Lectins.

Unit II

Aminoacids and its general properties. Classification of amino acids. Proteins– classification and general properties. Orders of protein structure, Primary- Secondary structure– the α -helix, β -pleated sheet. Protein sequencing methods.

Unit III

Lipids: Definition and classification of lipids. Biological significance of lipids. Types of Fatty acids-Essential, Non essential. Structure and biological functions of phospholipids, sphingolipids, glycolipids. Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins, thromboxanes and leukotrienes.

Unit IV

Nucleic acid: Structure of purines, pyrimidines, nucleosides and nucleotides. DNA double helical structure. A, B and Z forms of DNA. Properties of DNA- Density, viscosity, hypochromicity, denaturation and renaturation. DNA sequencing– chemical and enzymatic methods. Chemical synthesis of DNA. RNA– types and biological role- Secondary, tertiary structures of RNA.

Unit V

Vitamins: Definition and Classification - Source, Structure and biological role - Daily requirements and deficiency manifestation of fat soluble vitamins and water soluble vitamins.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication

1.	J. L. Jain	Fundamentals of Biochemistry	1 st / 2005	S. Chand and Company
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References

1. Biochemistry Dubay 4th edition William C.Brown Publication, 1998.
2. Biochemistry. Davidson and Sittmann, NMS 4th ed. Lippincott William's and Wilkins, 1999
3. Biochemistry – Voet and Voet. J O H N WI VP & *Publisher* Kaye Pace Associate Publisher, 2011.
4. Biochemistry Student Companion, by Berg, 7th Edition Berg, Jeremy M. / Tymoczko, John L. / Stryer, Lubert Published by W. H. Freeman, 2011.

Course Code	Course Title	L	T	P	C
20116DSC63C	Microbiome	4	1	0	3

AIM

- To inculcate on the role of normal flora and pathogenic microbes.

OBJECTIVE

- To understand the pathogenesis of various diseases
- To understand the various clinical microbiological techniques.

OUTCOME

CO1-Learn normal flora of human body

CO2- Get information about various sources of infection and transmission

CO3- Epidemiology, pathogenesis and treatment of bacterial, fungal and viral diseases

CO4- Learn Strategy of antimicrobial therapy.

Unit – I

Normal microbial flora of human – Host – parasite interaction: The Process of infection. Infective syndromes and diagnostic procedure - Strategy of antimicrobial therapy – Epidemiology and control of community infections.

Unit – II

General properties, epidemiology, transmission, pathogenesis, Symptoms, laboratory diagnosis, prevention and Treatment of the following Bacterial diseases: a) Pneumonia, b) Whooping-cough, c) Meningitis d) Diphtheriae) Pulmonary Tuberculosis, f) Leprosy, g) Typhoid, h) Cholera i) Tetanus, j) Syphilis, k) Gonorrhoea, d) Dental carries.

Unit - III

Mycobacterium: Mycobacterium tuberculosis, Mycobacterium leprae. Spirochaetes, Mycoplasma, Actinomycetes, Helicobacter, Compylobacter and other miscellaneous bacteria, Rickettsia, Chlamydia.

Unit – IV

General properties, epidemiology, transmission, pathogenesis, Symptoms, laboratory diagnosis, prevention and Treatment of the following viral diseases: Small pox, Influenza, Measles, Poliomyelitis, Common cold(Rhino virus), Hepatitis, Encephalitis, Rabies, AIDS.

Unit – V

Pathogenic Fungal diseases- Superficial, Subcutaneous and systemic mycoses, Protozoa-Amoebiasis, Malaria, Helminthes-Liverfluke, Filariasis, Hospital acquired infections: Hospital infections Principles of control – Committee – functions; Hospital waste disposal

- Ethical committee – functions.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Sherris	Medical Microbiology	4 th /2004	McGraw-Hill Companies, Inc.
2.	V.V. Kale, K.P. Bhusari	Applied Microbiology (Pharmacy and other Bioscience)	1 st /2001	Himalaya Publishing House
3.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork

References

- 1 Schachter, M., Med off, G. and Eisenstein, B.C.(1993) mechanism disease, 2nd Edn. Williams and Wilkins Baltimore
- 2 Ananthanarayan & Paniker's Textbook of Microbiology, 8th Ed., Orient Longsman, India; 2009
- 3 Smith, C.G.C(1976).Epidemiology and Infections. Medowleaf PressL shildon, England
- 4 Stokes,J., Ridway, G.L., and Wren, M.W.D.,(1993). Clinical Microbiology 7th Edn. Arnold a division of Hodder and Stoughton.
- 5 Wistriench, G.A. And lechtonan, M.D.(1988). Microbiology, 5th Edn., Mac publishing company NY
- 6 Atlas, R.M. (1989) Microbiology – fundamentals and applications 2nd Edn. Maxwell Mac Millan International Edition

Course Code	Course Title	L	T	P	C
20116DSC63D	Tissue Culture	4	1	0	3

AIM

- The emergence of molecular genetics has revolutionized large areas of modern biological and biochemical research work and has had a huge impact on the biotechnology industry.

OBJECTIVE

- To extend the knowledge on molecular basis of mutation at microbial level
- To focus on gene regulation and expression mechanisms
- To understand the principles role of plasmids and gene transfer methods

OUTCOME

CO1- Understood genome organization of model organisms.

CO2 - Learn molecular mechanisms that underlie mutations.

CO3- Study about transformation,transduction and conjugation.

CO4- Are able to describe the nature of the transposable elements

Unit I

Brief history of tissue culture

a. Cellular totipotency

b. Concept of dedifferentiation, redifferentiation and organogenesis

Unit II

Tissue culture media

Media composition Selection of media Media preparation

Unit III

Micropropagation

a. Selection of suitable material

b. Stock plant selection

c. Parts of plant

d. Size of explants

e. Avoid diseased tissue

Unit IV

Types of plant tissue culture - Meristem culture, Callus culture, Anther culture, Embryo culture, Ovary culture, Ovule culture, Pollen culture

Unit V

Benefits of plant tissue culture - Rapid multiplication of clones Genetic uniformity Aseptic condition Controlled environment

References

1. R Keshavachandran and K V Peter. Plant Biotechnology: Methods in Tissue Culture and Gene Transfer. Orient Blackswan.
2. Haberlandt, G. (1902) KulturversuchemitisoliertenPflanzenzellen. Sitzungsber. Akad. Wiss. Wien. Math.-Naturwiss. Kl., Abt. J. 111, 69–92.
3. Noé, A. C. (1934). "Gottlieb Haberlandt". Plant Physiol. 9 (4): 850– 855. doi:10.1104/pp.9.4.850. PMC 439112. PMID 16652925.
4. Plant Tissue Culture. 100 years since Gottlieb Haberlandt. Laimer, Margit; Rücker, Waltraud (Eds.) 2003. Springer ISBN 978-3-211-83839-6
5. Martin, Bernice M. (2013-12-01). Tissue Culture Techniques: An Introduction. Springer Science & Business Media. pp. 29–30. ISBN 978-1-4612-0247-9.
6. Simon, Eric M. (1988). "NIH PHASE I FINAL REPORT: FIBROUS SUBSTRATES FOR CELL CULTURE (R3RR03544A) (PDF Download Available)". ResearchGate. Retrieved 2017-05-22.

Course Code	Course Title	L	T	P	C
20116AEC64L	Industrial Microbiology Lab	0	0	3	2

Aim:

- To train students for industrial production of microbial products.

Objectives

- Methods for screening of industrial important microbes.
- Production of various commercial products using microorganisms.

Outcomes

CO1- To acquire hands on training various microbes for industrial practices

CO2- To know the Screening of desired microbes

CO3-To Learn the optimization process for scale up process

CO4-To understand the technical knowledge on upstream and downstream processing.

Lab work

1. Whole cell immobilization – alginate –Cyanobacteria
2. Estimation of citric acid - *Aspergillus*
3. Estimation of ethanol - Fruit juice
4. Spawn production - Mushroom
5. Mushroom cultivation
6. Starch hydrolysis

Demonstration

1. Preparation of fermented food –cheese

Course Code	Course Title	L	T	P	C
20116SEC65L	Clinical Microbiology Lab	0	0	3	2

Aim:

- To provide technical knowledge on collection and processing of clinical samples.

Objectives

- To isolate and identify the pathogens present in clinical samples.

Outcomes

CO1- To Get practical knowledge in specimen collection and processing

CO2- To gain Knowledge about cyst and protozoa identification.

CO3- To know the Technical practice on diagnosis of pathogenic infection

CO4- To Determine antimicrobial activity of microorganisms.

Lab work

- Examination of parasitic ova and cysts from faecal samples.
- Identification of pathogenic organism with a smear, culture and biochemical test
- Staphylococcus sp*, *E.coli*, *Klebsiella sp*, and *Salmonella typhi*

Demonstration

- LP Mount - *Trichophyton sp.* *Microsporum sp*

Spotters:

- Slides of pathogenic bacteria, fungi and parasites:
- Electron micrographs of viruses – Pox viruses, Herpes simplex virus, HIV, HBV,
 - *Staphylococci*
 - *Streptococci*
 - *Mycobacterium leprae*
 - *Trypanosoma pallidum*
 - *Leptospira sp.*
 - *Bacillus subtilis*
 - *Klebsiella sp.*
 - *E.coli.*
 - *Clostridium tetani.*
 - Permanent mounts of dermatophytes
 - *Candida sp.*
 - *Cryptococcus sp.*
 - *Maduromycetes.*

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of Learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

Open Elective

Course Code	Course Title	L	T	P	C
201ENOEC	Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism

Objective:

- To instil in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub-editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist
- Explore the different kinds of news

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub-editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		

Course code	Course Title	L	T	P	C
201MAOEC	Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, “Operations Research”

Course Code	Course Title	L	T	P	C
201PHGEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.

UNIT – I: INTRODUCTION

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges : AC bridges – Maxwell, Owen, Schering and deSauty’s bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Integrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhmey – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	Course Title	L	T	P	C
201CEOEC	Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislative aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.
High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

Introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	L	T	P	C
201CSOEC	E Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

Course Code	Course Title	L	T	P	C
201CAOEC	Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Introduction to the Internet: networking- internet – email – Internet Technologies: modem internet addressing .

UNIT II

Internet browsers: Internet Explorer – Netscape navigator- Introduction to HTML: Html document – anchor tag – hyperlink.

UNIT III

Head and body sections: Header section – titles – links- colorful web page – sample html document – Designing the body section: paragraph – tab setting.

UNIT IV

Ordered and unordered lists: list – unordered list – heading in a list- order list- nested list.

UNIT V

Table handling: tables – table creation in html cell spanning multiple rows and columns- coloring cells- sample tables- frames frame set definition- nested frames set.

REFERENCE BOOKS

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
201CMOEC	Open Elective – Banking Service	4	0	0	2

AIM:

To Provide the Bank is financial institution which is involved in borrowing and lending money.

OBJECTIVE:

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking, ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits-Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking-Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features-Registration-Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM-Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh,Justin paul .



SCHOOL OF ARTS AND SCIENCE

Department of Microbiology

M.Sc. Microbiology Syllabus

[Regulation 2020]

Skill development	
Skill development/Employability	
Employability/Entrepreneurship/Skill development	



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School of Arts and Science
Department of Microbiology
M. Sc., Syllabus-Regulation 2020

Master of Science in Microbiology

Our curriculum is intended to teach our majors in a diversity of significant microbiological disciplines, as well as to inspire, improve, technological skills and capabilities that take persistent value beyond the teaching space.

M. Sc., Graduate Attributes

- Capability and motivation for intellectual development.
- Research, inquiry and analytical thinking abilities.
- Communication in intra and inter disciplinary
- Ethical, social and professional understanding
- Information literacy in respective discipline
- Teamwork, collaborative and management skills in scientific research

M. Sc Programme Educational Objectives-PEO

- **PEO1-** To provide detailed knowledge of Microbiology and their application fields. To understand the beneficial and harmful role of microorganisms in the environment and in the industries.
- **PEO2-** To understand the fundamentals of physiological reactions including metabolic pathways and biochemical reactions in microorganisms. To understand the fundamental concepts of immunology, biochemistry, biotechnology and genetics etc.
- **PEO3-** To develop human resource and entrepreneurs in microbiology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.
- **PEO4-** Understand modern microbiology - practices and approaches with an emphasis in technology application in pharmaceutical, medical, industrial, environmental and agricultural areas.
- **PEO5-** Gain experience with standard molecular tools and approaches utilized: manipulate genes, gene products and organisms. Become familiar with handling of Laboratory animals for the research purpose. Interpret differences in data distributions via visual displays.

M.Sc Programme Specific Outcomes (PSOs)

- **PSO** -Upon master graduation, Microbiology majors will master a set of advanced skills, which would be useful to function effectively as professionals and to their continued development and learning within the field of Microbiology.
- **PSO** - Able to explain why microorganisms are ubiquitous in nature, inhabiting a multitude of habitats and occupying a wide range of ecological habitats.
- **PSO** -Able to cite examples of the vital role of microorganisms in biotechnology,fermentation, medicine and other industries important to human well-being.
- **PSO** -Able to demonstrate that microorganisms have an indispensable role in the environment, including elemental cycles, biodegradation etc

M. Sc Programme Outcome-PO

- PO1- Vital Thinking: Acquire knowledgeable actions after identifying the hypothesis that frame our idea and dealings, read-through out the degree to which these hypothesis are precise and suitable, and give the impression of being at our thoughts and assessments (academic, organizational and individual) from diverse perception.
- PO2- Effectual citizenship: Reveal empathetic social concern and fairness centred national progress and the capability to act with and take part in civic life through volunteering
- PO3- Ethics: Be aware of diverse value systems including the individual, under the ethical dimensions of personal choice, and believe responsibility for them.
- PO4- Environment and Sustainability: Analyze the importance of microbes for environmental clean-up and sustainable development.
- PO5- Self directed and life-long learning: To gain the talent to employ in self-determining and life-long learning in the broadest circumstance socio technological transforms.
- PO6- Economic liberty and employability potential: attain the ability to be concerned in economically sustainable opening and pound entrepreneurial skill.



School of Arts and Science
Department of Microbiology
M. Sc., Syllabus-Regulation 2020

Course Code	Course Title	L	T	P	C
SEMESTER I					
20216SEC11	Prokaryotic Microbiology	6	1	0	5
20216SEC12	Eukaryotic Microbiology	6	1	0	5
20216SEC13	Microbial Physiology	6	1	0	4
20216SEC14L	Fundamentals of Microbiology Lab	0	0	4	2
20216DSC15	Discipline Specific Elective I	5	0	0	4
20216RLC16	Research Led Seminar	-	-	-	1
	Total	23	3	4	21
SEMESTER II					
20216SEC21	Industrial Microbiology	5	1	0	5
20216SEC22	Environmental and Agricultural Microbiology	5	1	0	5
20216SEC23	Clinical Microbiology	5	0	0	4
20216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	4	2
20216DSC25_	Discipline Specific Elective II	5	0	0	4
20216RMC26	Research Methodology	3	0	0	2
20216BRC27	Participation in Bounded Research	-	-	-	2
	Total	23	2	4	24
SEMESTER III					
20216SEC31	Microbial Genetics	6	1	0	6
20216SEC32	Microbial Biotechnology	6	1	0	6
20216SEC33L	Microbial Genetics and Biotechnology Lab	0	0	5	3
20216DSC34_	Discipline Specific Elective III	5	0	0	4
202_OEC	Open Elective	4	0	0	4
20216SRC35	Design/Socio technical research	-	-	-	2
	Total	21	2	5	24
SEMESTER IV					
20216SEC41	Pharmaceutical Microbiology	6	1	0	6
20216SEC42	Biostatistics and Bioinformatics	6	1	0	6

20216SEC43L	Pharmaceutical Microbiology Lab	0	0	5	3
20216SEC44	Discipline Specific Elective IV	5	0	0	4
20216PRW45	Project Work	-	-	-	6
20216PEE	Programme exit examinations	-	-	-	2
	Total	17	2	5	27
	Total Credits for the Program				96

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a) 20216DSC15A- Immunotechnology b) 20216DSC15B-Bioremediation and Waste Management
	Discipline specific Elective Courses-II
II	a) 20216DSC25A-Biomolecules b) 20216 DSC25B- Genomics and Proteomics
	Discipline specific Elective Courses-III
III	a) 20216DSC34A- Plant Tissue Culture b) 20216DSC34B-Nanotechnology
	Discipline specific Elective Courses-IV
IV	a) 20216DSC44A- Bioethics and IPR b) 20216DSC44B-Molecular Immunology

Open Electives

Semester	Open Elective Courses
III	a) 202ENOEC-Writing for the media b) 202MAOEC-Applicable Mathematics Techniques c) 202PHOEC-Bio-Medical Instrumentation d) 202CHOEC-Green Chemistry e) 202CSOEC – M-Marketing f) 202CMOEC- Financial Services

Credit Distribution:

Sem	SEC	DSC	GEC	RSB courses	Others	Total
I	16	4	-	1	-	21
II	16	4	-	4	-	24
III	15	4	3	2	-	24
IV	15	4	-	6	2	27
Total	62	16	3	13	02	96

SEMESTER I

Course Code	Course Title	L	T	P	C
20216SEC11	Prokaryotic Microbiology	6	1	0	5

AIM :

- Prokaryotic Microbiology introduces basic principles and then applies clinical relevance of many etiological agents responsible for global infectious diseases.

OBJECTIVES :

- The infectious disease cycle of the pathogens enables to solve the epidemics.
- The territory covered by infections and the immune response expands each year; we focus on pathogenic mechanisms in order to foster a student's ability to solve problems in their future clinical career.

COURSE OUTCOME

CO1- Scope and historical importance of microbiology

CO2- Understanding the features and classification of prokaryotes.

CO3- study about isolation and identification of microbes

CO4- Economic value of beneficial bacteria

Unit – I

Microbial classification and diversity of microorganisms – classification based on cellularity, cell and kingdom concepts – Whittaker's classification – major group of prokaryotic microorganisms – their characteristics – microbial diversity of viruses, bacterial and cyanobacteria.

Unit – II

Viruses: Introduction – Classification of viruses – cultivation of viruses, purification and assay, various methods of viral assays. Basic structure of viruses – symmetry – biochemical composition of viruses – Bacteriophages – Ultra structure of T₄ phage – multiplication of bacteriophages – viruses of fungi and algae, slow viruses, viroids, satellite viruses.

Unit – III

Plant viruses: Classification of plant viruses. Tobacco Mosaic Virus – Ultra structure of TMV, Multiplication of TMV. Viruses of various plant hosts / crops and diseases - Plant viruses as gene vectors.

Unit – IV

Bacteriology: Introduction – Diversity of bacterial flora – distribution – morphology of typical bacterial cell – Chemical composition of bacterial cell wall, Reproduction and genetic recombination, Transformation, Conjugation, Transduction, Bacterial growth rate, Bacterial culture methods and culture media for various bacteria. Isolation and enumeration of bacterial cultures, Identification – Gram staining technique, Bacterial diseases of Man.

Unit – V

General characteristics of other Bacteria – Mycobacteria, Myxobacteria, Rickettsia and Chlamydiae and Cyanobacteria – Classification of cyanobacteria – significance of Cyanobacteria in biofertilizers – *Archaeobacteria*, *Actinomycetes*, *Streptomyces*, *Actinoplanes*, *Maduramycetes* and their general characters

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, New york
2.	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3 rd / 2003	Chand Publishing

Reference Book:

1. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20216SEC12	Eukaryotic Microbiology	6	1	0	5

AIM

- To gain the knowledge with the various inner and outer structures of prokaryotes and in detail.

OBJECTIVES

- To learn the general principles and applications of microbiology

COURSE OUTCOME

CO1- General Features and taxonomy of eukaryotes

CO2- Knowledge about advanced research in mycology, phycology.

CO3- Scope of Algae used as a food

CO4- Economic importance of Lichens and algae

Unit – I

Differentiation of Eukaryotes and Prokaryotes – Salient features of Eukaryotes – Major groups of Eukaryotes – Algae, Fungi, Protozoa and lichens – Classification of Algae, Fungi and Protozoans. Significance of various Algae and fungi in Agricultural Microbiology - Significance of various fungi, algae in environmental biology – biodegradation of Xenobiotics, heavy metals and pesticides, Eukaryotic microbes in Bio pesticides.

Unit – II

Algae: Phycology – Introduction – Distribution of Algae, General features of algae Classification and general characters of prochlorophyta, Rhodophyta, Phaeophyta: Significance of Algae in production.

Unit – III

Biology of Lichens – fungal components and algal component: general characteristics of lichens, physiology of lichens, classification of lichens, Reproduction of lichens, Economic uses of lichens. Single cell protein (SCP) – Spirulina and significance: BGA and significance in agriculture.

Unit – IV

Mycology – Introduction – General characters of Fungi – Structure of fungi – Fungal cell, multiplication of fungi – Fungal diseases of Plants, Animals and Human - Beneficial fungi, VAM – fungi in soil fertility. Predaceous fungi and nematophagous fungi – Fungi in food spoilage and food infections.

Unit – V

Protozoans – Classification of Protozoa – General Characters of protozoa – general structure and life cycle of Amoeboid form – Nutrition and Reproduction in protozoans – Protozoan diseases of Animals and Man

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, New york
2	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3 rd / 2003	Chand Publishing

References

1. Microbiology (1993) Jr. M.J. Peczar, E.C.S. Chan and N.R. Kreig, Mc Graw Hill Inc., NewYork
2. General Microbiology, 1976. Roger Stanier, Fifth Edition,
3. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20216SEC13	Microbial Physiology	6	1	0	4

AIM :

- To enable the students to understand the physiology and metabolism of microorganismS.

OBJECTIVES :

- To impart knowledge on metabolic function and biochemical reaction going on inside the microbial cell.
- To teach metabolic pathways, their regulation and engineering, and methods used in their elucidation.
- To teach students about cell cycle, growth and methods to determine microbial growth.

COURSE OUTCOME (CO'S):

CO1- Understand the factors influencing the growth of microbes in ecosystem

CO2- Learn about Bioluminescence and their advantages.

CO3- Learn about microorganism to assimilate the nutrients for growth.

CO4- Study about metabolic pathway

Unit – I

Cell structure and function: Biosynthesis of peptidoglycan – Outer membrane, teichoic acid Exopolysaccharides; Cytoplasmic membrane – Pili, fimbriae, S-layer, Transport mechanisms – active, passive, facilitated diffusions – uni, sym, antiports. Electron carriers – artificial electron donors, inhibitors, uncouplers – energy bond – phosphorylation.

Unit – II

Microbial growth: Phases of growth curve – measurement of growth – calculations of growth rate – generation time – synchronous growth – induction of synchronous growth, synchrony index – factors affecting growth – pH, temperature, substrate and osmotic condition. Survival at extreme environments – starvation – adaptive mechanisms in thermophilic, alkalophilic, osmophilic and psychrophilic-Bioluminescence – mechanism – advantages.

Unit – III

Microbial pigments and carbon assimilation: Autotrophs – Cyanobacteria – photosynthetic bacteria and green algae – heterotrophs – bacteria, fungi, myxotrophs. Brief account of photosynthetic and accessory pigments – chlorophyll – fluorescences, phosphorescences – bacteriochlorophyll – rhodopsin – carotenoids – phycobiliproteins: Carbohydrates – anabolism – autotrophy – oxygenic – anoxygenic photosynthesis – autotrophic generation of ATP; fixation of CO₂ – Calvin cycle – C₃ – C₄ pathways. Chemolithotrophy – sulphur – iron – hydrogen – nitrogen oxidations – Brief account of methanotrophs in relation to CO₂ fixation.

Unit – IV

Microbial respiration and fermentative pathway: Respiratory metabolism – Embden Mayer

Hoff pathway – Enter Doudroff pathway – glyoxalate pathway – Krebs cycle – Oxidative and substrate level phosphorylation – reverse TCA cycles – Gluconeogenesis – Pasteur Effect – Fermentation of carbohydrates – homo and heterolactic fermentations. Cell division – endospore – structure – properties – germination.

Unit – V

Spore structure – Function: Cell division – endospore – structure – properties – germination – Microbial development, sporulation and morphogenesis. Hyphae vs yeast forms and their significance. Multicellular organization of selected microbes – Dormancy.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork
2	S. Meenakumari	Microbial physiology	1 st / 2006	MJP Publishers

Reference Book:

1. Microbial physiology and metabolism (1995) D.R. Caldwell, Wm. C.Brown, Publishers. USA
2. Microbial Physiology (1988). A.G. Moat and J.W. Foaster, John Wiley & Sons, New York.

Course Code	Course Title	L	T	P	C
20216SEC14L	Fundamentals of Microbiology Lab	0	0	4	2

AIM

- A student undertaking this course will be learning the principles behind the basic techniques

OBJECTIVES

- This course is put forward with the objectives of equipping the candidates with practical knowledge on basic techniques involved in the isolation,
- Characterization and identification of different types of microorganism.

COURSE OUTCOME :

CO1- practical knowledge about isolation and purification of microbes from various sources.

CO2- Training about staining experiments

CO3- Handling on light and compound microscope.

CO4- Learn essential biochemical analysis

EXPERIMENTS

1. Principles and methods and sterilization – (Wet, dry and cold sterilization)
2. Direct microscopic observations of bacterial shape – cocci, rods, chains, fungal spores, mycelium, yeast budding.
3. Preparation of Media: Nutrient broth, Nutrient agar, plates, slants, soft agar. Pure culture technique: Streak plate, spread plate and pour plate methods
4. Measurement of size of microbes – micrometry method. Motility determination – Hanging drop method.
5. Isolation and purification of cyanobacteria, actinomycetes, fungi and protozoans.
6. Staining methods: Simple, Negatives, acid fast, Gram staining, Capsule Metachromatic granular staining, Lactophenol cotton blue staining – Fungal slide preparation.
7. Measurement of growth – Direct haemocytometer count, viable count – growth curve,
8. Determination of growth rate and generation time.
9. Effect of pH, temperature and osmotic pressure on growth of bacteria.
10. Biochemical test: carbohydrate fermentation – acid – gas production: IMViC test; - Hydrolysis of starch: cellulose, gelatin, casein, catalase test, oxidase, urease test, nitrate reduction – triple sugar iron test, ONPG test, amino acid decarboxylase
11. Blood grouping
12. Widal test
13. Total count of RBC
14. Total count of WBC
15. Differential count of WBC
16. Erythrocyte Sedimentation Rate
17. Preparation of Buffer; pH measurement (Tris, phosphate, acetate buffer)

Reference:

1. Cappuccino and James, G(1996) Microbiology a laboratory manual, Addison Wesley Publishing company Inc. 4th Edition, England, California
2. Gerhardt. P. Murray, R.G. Wood, W.A. and Kreig, N.R. (1994) Methods of General and Molecular Bacteriology, Ed. American Society for Microbiology, Washington D.C
3. David R. Brooke. Bergey's Manual of Systematic Bacteriology (Vol.I) Eastern Halz, Springer Publication
4. James T. Stanley, Marving, P. Bryant, Bergey's Manual of Systematic Bacteriology (Vol.II), Nobert pfeming Springer Publishers

Discipline Specific Elective-I

Course Code	Course Title	L	T	P	C
20216DSC15A	Immunotechnology	5	0	0	4

AIM:

- To expose the students with the immune system of human body

OBJECTIVES:

- Objectives The aim of this course is to impart knowledge on the basic concepts of cells and components of immune system and immuno diagnostic techniques

COURSE OUTCOMES (CO'S):

CO1- Learn scope and history of immunology.

CO2- Study about immune system and lymphatic organs.

CO3- Learn tumor immunology

CO4- gain knowledge about various immunological techniques

Unit – I

Introduction: History of immunology – types of immunity – Innate and Acquired – Passive and Active - Humoral and cell Mediated Immunity. Lymphoid organs – autoimmunity, physiology of immune response — Immunohaematology

Unit - II

Antigens and Antibodies: Antigens – structure and properties – types – ISO and allo –haptons; adjuvants – antigen specificity, vaccines and toxoids. Immunoglobulins – structure - heterogeneity – types and subtypes – properties (physico – chemical and biological); theories of antibody production - Complement – structure – components - properties and functions of complement components; complement pathways and biological consequences of complement activation

Unit - III

Major Histocompatibility complex: Structure and function of MHC and the HLA system. Gene regulation and Ir – genes. HLA tissue and transplantation – tissue typing methods for organ and tissue transplantation in humans; Graft versus host reaction and rejection. Autoimmunity –diseases-mechanism and disease with their diagnosis

Unit - IV

Tumor Immunology: tumour antigens – immune response to tumors immunodiagnosis of tumors – detection of tumor markers alphafoetal proteins, carcinoembryonic antigen etc. Immunotherapy of malignancy, Hypersensitivity – monoclonal antibody – production and their applications

Unit - V

Immunological techniques and their principles: In vitro of immunological methods – agglutination, precipitation, complement fixation, Immunofluorescence, ELISA, Radio Immuno Assays. Immunodiffusion, Immuno electrophoresis, isoelectric focusing – cytotoxicity assay – labeled – antibody technique in light and Electron Microscopy and Immunohistochemistry. Techniques of Immunization – use of adjuvants – separation of lymphocytes – and preparation of Rosette forming cells - In vivo methods – skin tests and immune complex tissue demonstrations - Applications of these methods in diagnosis of microbial diseases.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Ivatt Roitt, Jonathan Brostoff, David Male	Immunology	3 rd /1993	Mosby Inc, St. Louis, MO
2.	R.A. Goldsby, T. J. Kindt, B.A. Osborne, J. Kuby	Immunology	5 th /2003	W.H. Freeman and Company
3.	M.S. Aslam	Immunobiology	1 st /2000	Campus Book International

References

1. Immunology (2002), C.V Rao, First Edition, Narosa Publications.
2. Essentials of Clinical Immunology (1986) H.Chapel and Halbey, ELBS
3. Essentials Immunology (1994) M.Rolt Blackwell Scientific Publication, Oxford

Course Code	Course Title	L	T	P	C
20216DSC15B	Bioremediation and Waste Management	5	0	0	4

AIM

- To study the water and waste water treatment for recycling process.

OBJECTIVES:

- To impart knowledge on the management of solid and liquid wastes from municipal and industrial sources and principles of remedial measures of recycling, reuse and recover from the wastes.

COURSE OUTCOMES:

CO1- Understanding on the management of solid and liquid wastes

CO2- Learn the principles of remedial measures of recycling, reuse and recover from the wastes.

CO3- Understand the mechanism and role of microbes in the degradation of various pollutants

UNIT – I

Wastes– Classification and Quantification – Solid Waste Management and Disposal: Sources and Generation of Solid Waste – characterization, composition and classification. Hazardous Waste Management: Cyanides, Dioxins, Detergents, Plastics, Nylon and Paper. Waste Minimization approaches – Monitoring and Management strategies. Radioactive Waste: Sources, half life of radioactive elements, modes of decay. Effects on Plants, Animal and Man. Low and High-level Radioactive Waste Management – Waste Minimization and Treatment, Radiation standards.

UNIT - II

Recycling of Wastes – Types – sources – composition of waste – recycling of waste for Industrial, Agricultural and Domestic Purposes; Recycling of Metals, Reuse, recovery and reduction of paper and plastics; Recycling in Food Manufacturing, Beverages, Apparel, Leather, Paper, Pulp, Chemical and other industries; Fly Ash utilization. Waste Disposal Methods – composting, incineration, pyrolysis, medical waste disposal strategies.

UNIT – III

Microbial Activity in Soil and Ground Water, Lithosphere as Microbial habitat, Microorganisms in rock and minerals, Mineral soil and Organic soil. Physiological groups of prokaryotes, Geomicrobial transformations – Biodegradation of carbonates – Biomobilization of silicon, phosphate, nitrogen. Geomicrobiology of fossil fuel, methane, peat, coal and petroleum.

UNIT – IV

Principles of Bioremediation – Rapid growth and Metabolism- Genetic plasticity – Metabolic pathways for the degradation of xenobiotics, hydrocarbons – Microbial site characterization – Biodegradation potential – Bioprocess design, optimization – Microbial removal rates – inherent problems associated with biotreatment studies. Microbiological methodologies –

Standard biotreatability protocols – Quantification of biodegradation; Biocleaning -Chernobyl radioactive contaminated area - Phytoremediation.

UNIT – V

Aerobic Bioremediation: Bioremediation of Surface Soils: Fate and transport of contaminants in the Vadose zone – Biodegradation in soil ecosystems – Types of soil treatment systems – Bioreactors. Subsurface Aerobic Bioremediation: in situ Bioremediation – in situ Bioventing – in situ treatments of Harbour Sediments and Lagoons. Bioremediation in fresh water and marine systems: Bench and Pilot Scale studies – in situ Bioreactor treatment of sediments – in situ treatment in marine ecosystem. Anoxic/Anaerobic Bioremediation: Anoxic/Anaerobic Processes – Fermentation, Degradation of xenobiotics – Anoxic/Anaerobic bioremediation of hydrocarbons, Phenols, Chlorophenolic compounds, Polycyclic Aromatic Hydrocarbons (PAH), Heterocyclic Compounds, Cyanide, dyes,

REFERENCES

1. Microbial Ecology, IV Ed., Atlas, R.M and Bartha,R.,(2000) Addison Wesley Longman Inc.
2. Bioremediation, Baker,K.H. and Herson,D.S., (1994) Mc Graw–Hill Inc, New York.
3. Biology of Microorganisms, VII Ed., Brock,T.D., Madigan,M.T. Martinko,J.M. and Parker, J (1994) Prentice Hall, New Jersey.
4. Geomicrobiology, Ehrlich,H.L (1996) Marcel Dekker Inc., New York.
5. Bioremediation – Principles, Eweis,J.B., Ergas,S.J, Change,D.P.Y and Schroeder, E.D (1998). Mc Graw-Hill Inc.
6. Environmental Engineering, Kiely, G (1998) Irwin/Mc Graw Hill International, U.K.
7. Hazardous Waste Management, II Ed, LaGrega,M.D.,Buckingham,P.L., and Evans, J.C (2001) Mc Graw Hill Inc.

SEMESTER II

Course Code	Course Title	L	T	P	C
20216SEC21	Industrial Microbiology	5	1	0	5

AIM

- To study about the industrially importance microorganisms, fermenter design, fermentation process.

OBJECTIVE

- To give knowledge on strain improvement methods.
- To learn about upstream fermentation process .
- To understand about downstream fermentation process

OUTCOME.

CO1- Students will get knowledge on strainimprovement.

CO2- Enable them to work in fermentationindustry.

CO3- Students will get idea on upstream and downstream fermentationprocess

CO4- Economic importance of Bio products

Unit I

Historical development of industrial microbiology: major classes of products and processes and micro organisms used in industrial processes. Industrially important microbes and their development: Screening methods for industrial microbes –strain selection and improvement – Mutation and recombinant DNA techniques for strain development. Batch culture and continuous culture

Unit – II

Fermenters – Design of a fermenter, and components – asepsis and containment requirements – body construction and temperature control – aeration and agitation systems – sterilization of fermenter, air supply, and medium; aseptic inoculation methods – sampling methods, valve systems –monitoring and control devices and types of fermenters and its basic functions.

Unit – III

Downstream processing – extraction, separation, precipitation, filtration, centrifugation, cell disruptions, liquid-liquid extraction, chromatography, recovery & purification, process and quality control.

Unit – IV

Production of Primary metabolites: Organic acids (citric acid, lactic acid, acetic acid) and Amino acids (glutamic acid, lysine). Production of Vitamins (B2 and B12). Production of Secondary metabolites: Antibiotics: beta-lactams (Penicillins, Cephalosporins), aminoglycosides (streptomycin), macrolides (erythromycin) and Quinones (Tetracycline).

Unit –V

Bio products: Bio-pesticides, bio-fertilizers, natural bio-preservatives (Nisin), High Fructose Corn Syrup, Bioplastics and biopolymers (Poly Lactic acid, Poly Glutamic acid, Poly hydroxyl alkoanates, Xanthum Gum and Dextran), Biotransformations - steroids and non-steroids. Enzymes - Proteases, amylases, lipases, cellulases, pectinases, glucose isomerase, L-Asparaginase. Production of vaccines and recombinant proteins (Insulin, Streptokinase). Production of Biofuels (Biomethanol, Bioethanol, Biobutanol, Biohydrogen and Biodiesel).

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	L.E. Casida Jr	Industrial Microbiology	1968	Wiley
2	W. Crueger and A. Crueger	A text book of Industrial microbiology	2 nd /1990	Sinauer Associates Incorporated
3	Prescott and Dunn's	Industrial Microbiology	4 th /1987	CBS Publishers and Distributors

References

- 1 Alexander, M.(1961). Introduction to soil microbiology, Wiley and Sons Inc. New York and London
- 2 Demain, A.L. and Davies, J.E (1999) Manual of Industrial Microbiology and Biotechnolgy. ASM Press
- 3 Glick, B.R and Pasternak, JJ(1994) Molecular Biotechnology, ASM Press
- 4 Stanbury, P.F, Whitaker, A. and Hall, S.J.(1991). Principles of Fermentation Technology, Pergamon Press
- 5 Glick, B.R and Pasternak, JJ(1998) Molecular Biotechnology, II Edition , ASM Press, New York
- 6 Mittal, D.P.(1999) Indian Patents Law, Taxmann, Allied Services (P) limited
- 7 Tortora, G.J., Fernke, .B.R. and Case, C.L.(2001), Microbiology – An Introduction, Benjamin Cummings

Course Code	Course Title	L	T	P	C
20216SEC22	Environmental and Agricultural Microbiology	5	1	0	5

AIM

- To study about the biofertilizers, plant disease and increasing soil fertility.v

OBJECTIVES

- To educate the students about concepts of designs of water distribution systems, sewer networks, working principles and design of various physical, chemical and biological treatment systems of water and wastewater.

COURSE OUTCOME (CO)

CO1- Huge Insights into these precious areas of Environmental microbiology.

CO2- Students able to know detailed idea about biofertilizer production and plantdisease.

CO3- Role ofMicrobes in marine and fresh water environment

CO4- Scope of Recycling of Liquid and Solid wastes

Unit I

Aerobiology- Significance of air microflora - Microbial air pollution- sources, biological indicators and effects on plants and human beings. Enumeration of bacteria from air, Air sampling devices, Outline of Airborne diseases (Bacterial, Fungal and Viral), Air sanitation. Biogeochemical cycles -Nitrogen, Carbon, Phosphorous, Sulphur, Iron and their importance.

Unit II

Microbes in marine and fresh water environment – eutrophication – Water pollution – sources and nature of pollutants in water – sewage – treatment of liquid waste – primary, secondary and tertiary treatment – water borne diseases – Assessment of water quality – BOD and COD. Solid waste treatment – saccarification and pyrolysis.

Unit III

Recycling of Liquid and Solid wastes-Composting-Biogas, Mushroom and SCP production from waste. Biodegradation of complex polymers (Cellulose, Hemicellulose, Lignin, Chitin and Pectin), Bioremediation (*In-situ*, *Ex-situ*, Intrinsic), Bioaugmentation and Biostimulation. Bioleaching (Copper and Uranium) -Xenobiotics degradation (Heavy metals).

Unit IV

Microbial association with plants - Phyllosphere, Rhizosphere, Mycorrhizae, nitrogen fixing organism – symbiosis, asymbiosis, associate symbiosis – phosphate solubilizers – application of biofertilizers in agriculture. Biology of nitrogen fixation – genes and regulations in *Rhizobium*.

Unit V

Bacterial, viral and fungal plant pathogens. Morphological, physiological changes with reference to disease establishment in plants – plant protection – phenolics – phytoalexins and related compounds. Disadvantages of chemical pesticides. Microbial pesticides- types, mechanisms, advantages and limitations.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	B. Nagamani	Soil And Agricultural Microbiology	1 st / 2007	Margham Publicat
2.	Dirk, J., Elsas, V., Trevors, J.T., Wellington	Modern Soil Microbiology	1997	Marcel Dekker INC
3.	R.R. Mishra	Soil Microbiology	1 st /2004	CBS Publication

References

1. Atlas Ronald M, Bartha Richard. Microbial Ecology 2nd Edition. Benjamin/Cummings Publishing Company, California. 1987.
2. Baker WC and Herson DS. Bioremediation – McGraw Hill Inc., New York. 1994.
3. Chatterji AK. Introduction to Environmental Biotechnology. 2005
4. Christon J Hurst, Manual of Environmental Microbiology.2nd edition. American Society for Microbiology, Washington. 2002.

Course Code	Course Title	L	T	P	C
20216SEC23	Clinical Microbiology	5	0	0	4

AIM

- To inculcate on the role of normal flora and pathogenic microbes.

OBJECTIVE

- To understand the pathogenesis of various diseases
- To understand the various clinical microbiological techniques.

OUTCOME

CO1-Learn normal flora of human body

CO2- Get information about various sources of infection and transmission

CO3- Epidemiology, pathogenesis and treatment of bacterial, fungal and viral diseases

CO4- Learn Strategy of antimicrobial therapy.

Unit – I

Normal microbial flora of human – Host – parasite interaction: The Process of infection. Infective syndromes and diagnostic procedure - Strategy of antimicrobial therapy – Epidemiology and control of community infections.

Unit – II

General properties, epidemiology, transmission, pathogenesis, Symptoms, laboratory diagnosis, prevention and Treatment of the following Bacterial diseases: a) Pneumonia, b) Whooping-cough, c) Meningitis, d) Diphtheriae, e) Pulmonary Tuberculosis, f) Leprosy, g) Typhoid, h) Cholera, i) Tetanus, j) Syphilis, k) Gonorrhoea, d) Dental carries.

Unit - III

Mycobacterium: Mycobacterium tuberculosis, Mycobacterium leprae. Spirochaetes, Mycoplasma, Actinomycetes, Helicobacter, Compylobacter and other miscellaneous bacteria, Rickettsia, Chlamydia.

Unit – IV

General properties, epidemiology, transmission, pathogenesis, Symptoms, laboratory diagnosis, prevention and Treatment of the following viral diseases: Small pox, Influenza, Measles, Poliomyelitis, Common cold (Rhino virus), Hepatitis, Encephalitis, Rabies, AIDS.

Unit – V

Pathogenic Fungal diseases- Superficial, Subcutaneous and systemic mycoses, Protozoa-Amoebiasis, Malaria, Helminthes-Liverfluke, Filariasis, Hospital acquired infections: Hospital infections Principles of control – Committee – functions; Hospital waste disposal – Ethical committee – functions.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
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1.	Sherris	Medical Microbiology	4 th /2004	McGraw-Hill Companies, Inc.
2.	V.V. Kale, K.P. Bhusari	Applied Microbiology (Pharmacy and other Bioscience)	1 st /2001	Himalaya Publishing House
3.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 th /1993	Tata McGraw-Hill, Inc, Newyork

References

- 1 Schachter, M., Med off, G. and Eisenstein, B.C.(1993) mechanism disease, 2nd Edn. Williams and Wilkins Baltimore
- 2 Ananthanarayan & Paniker's Textbook of Microbiology, 8th Ed., Orient Longsman, India; 2009
- 3 Smith, C.G.C(1976).Epidemiology and Infections. Medowleaf PressL shildon, England
- 4 Stokes,J., Ridway, G.L., and Wren, M.W.D.,(1993). Clinical Microbiology 7th Edn. Arnold a division of Hodder and Stoughton.
- 5 Wistriench, G.A. And lechtonan, M.D.(1988). Microbiology, 5th Edn., Mac publishing company NY
- 6 Atlas, R.M. (1989) Microbiology – fundamentals and applications 2nd Edn. Maxwell Mac Millan International Edition

Course Code	Course Title	L	T	P	C
20216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	4	2

AIM

- To provide technical knowledge on collection and processing of clinical samples .

OBJECTIVE

- To prepare them to work in clinical laboratory .
- To learn the technique for isolation and identification of pathogens

OUTCOME

CO1- Get practical knowledge in specimen collection and processing

CO2- Become technically expert which will helpful to work in clinical laboratory

CO3- Learn practical understanding of diagnosis of pathogens.

CO4- Acquire knowledge on fermentation process

CO5- Learn bio fertilizer and inoculants production

Industrial and Clinical Microbiology

- Citric acid fermentations by *Aspergillus niger*
- Alcoholic fermentation of fruit juice by yeast (*Saccharomyces cerevisiae*).
- Immobilization techniques using any microbe- alginate beads
- Hydrolysis of starch
- Testing sensitivity of bacteria to antibiotics and Assessing minimum inhibitory concentration(MIC) of antibiotics
- Isolation and identification of certain pathogenic microbes from urine
- Hemoglobin content of blood
- Serum analysis, sugar analysis in blood and urine

Agricultural and Environmental Microbiology

- Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes)
- Isolation and staining of vesicular arbuscular mycorrhizae from plant.
- Isolation and culturing of Rhizobium from root nodules of higher plant
- Mushroom cultivation
- Isolation and identification of air-borne microbes
- Effects of high salt concentration on microbial growth
- Determination of BOD and COD of polluted/pond water.
- Bacterial examination of drinking water by membrane filter technique and MPN

Visit to commercial production units – ethanol, acetic acid, vaccine and Spirulina

Visit to CFTRI/DFRL/FOOD INDUSTRIES and report should be written in the practical record

Reference:

1. Clescri, L.S., Greeberg, A.E., and Eaton, A.D. (1998) Standard Methods for Examination of Water and Waste Water, 20th Edition, American Public Health Association
2. Gerhardt, P., Murray R.G., Wood, W.A. and Kreig, N.R. (1994). Methods for General Land Molecular Bacteriology, ASM Publications, Washington
3. Patricia Cuning (1995) Official Methods of Analysis, Vol I and II, 16th Edition, Arlington, Virginia, USA, AOAL.
4. Richard G., Burus and Howard Slater (1982) Experimental Microbial Ecology, Blackwell Scientific Publishers
5. Tuffery (1996). Laboratory Animal, an Introduction, II Edition, John Wiley and Sons New York

Discipline Specific Elective-II

Course Code	Course Title	L	T	P	C
20216DSC25A	Clinical research and development	5	0	0	4

AIM

To know the functions of Biomolecules

OBJECTIVE :

- To understand the structure and functions of carbohydrates, lipids , proteins and nucleic acids
- To understand the role of nucleic acid in proteins synthesis

OUTCOME

CO1- They acquire knowledge in the quantitative and qualitative estimation of biomolecules

CO2- They study the influence and role of structure in reactivity of biomolecules

CO3- Students have a thorough understanding on the role of biomolecules and their functions.

Unit I

Carbohydrates: Structure and biological functions of Mono, di and Polysaccharides. Types of polysaccharides: Homo polysaccharides -chitin, fructans, mannans, xylans, and galactans. Structure and biological importance of Hetero polysaccharides- Glycoprotein – bacterial cell wall polysaccharides, marine polysaccharides and Lectins.

Unit II

Aminoacids and its general properties. Classification of amino acids. Proteins– classification and general properties. Orders of protein structure, Primary- Secondary structure– the α -helix, β -pleated sheet. Protein sequencing methods.

Unit III

Lipids: Definition and classification of lipids. Biological significance of lipids. Types of Fatty acids-Essential, Non essential. Structure and biological functions of phospholipids, sphingolipids, glycolipids. Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins, thromboxanes and leukotrienes.

Unit IV

Nucleic acid: Structure of purines, pyrimidines, nucleosides and nucleotides. DNA double helical structure. A, B and Z forms of DNA. Properties of DNA- Density, viscosity, hypochromicity, denaturation and renaturation. DNA sequencing– chemical and enzymatic methods. Chemical synthesis of DNA. RNA– types and biological role- Secondary, tertiary structures of RNA.

Unit V

Vitamins: Definition and Classification - Source, Structure and biological role - Daily requirements and deficiency manifestation of fat soluble vitamins and water soluble vitamins.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	J. L. Jain	Fundamentals of Biochemistry	1 st / 2005	S. Chand and Company

References

1. Biochemistry Dubay 4th edition William C. Brown Publication, 1998.
2. Biochemistry. Davidson and Sittmann, NMS 4th ed. Lippincott William's and Wilkins, 1999
3. Biochemistry – Voet and Voet. J O H N WI VP & Publisher Kaye Pace Associate Publisher, 2011.
4. Biochemistry Student Companion, by Berg, 7th Edition Berg, Jeremy M. / Tymoczko, John L. / Stryer, Lubert Published by W. H. Freeman, 2011.

Course Code	Course Title	L	T	P	C
20216DSC25B	Soil and Water Engineering	5	0	0	4

AIM

To know the basic principles of genes and proteins

OBJECTIVES:

To understand the gene functions and its genetic engineering aspects

To understand the protein functions and its genetic engineering aspects

COURSE OUTCOME :

CO1- Students gain the knowledge about the interactions between the proteins

CO2- Get the information to predict cell behavior or develop drug targets.

CO3- Rapidly evolving scientific area into **genomes**, proteomes and databases

CO4- Learn to store various data NCBI, DDBJ and EMBL

Unit I

Genomics: genetic and physical maps, physical mapping and map-based cloning, choice of mapping population, simple sequence repeat loci, southern and fluorescence in situ hybridization(FISH) for genome analysis, chromosome microdissection, molecular markers in genome analysis

Unit II

Genome sequencing: genome sizes, organelle genomes, genomic libraries, strategies for genome sequencing, packaging, transfection and recovery of clones, application of sequence information for identification of defective genes. Pharmacogenetics, cancer genetics; immunogenetics; mapping of human genome; somatic cell genetics; DNA polymorphism in mapping; structure and function; biochemical genetics; polygenic inheritance

Unit III

Proteomics: Sample preparation, Gel-based proteomics - two-dimensional gel electrophoresis (2-DGE), two-dimensional fluorescence difference in-gel electrophoresis (DIGE), Staining methods, PF-2D, Tandem FPLC, Mass spectroscopy: basic principle, ionization sources, mass analyzers, different types of mass spectrometers (MALDI-TOF Q-TOF, LC-MS).

Unit IV

Nuclear magnetic resonance spectroscopy (NMR), basic principles, chemical shift, spin-spin interaction, NOE, 2D-NMR, NOESY, COSEY. X-ray Crystallography: Principle of X-ray diffraction, scattering vector, structure factor, phase problem, reciprocal lattice and Ewald sphere, Miller indices, Zone axes, crystal lattice, Lane Equations, Bragg's law, special properties of protein crystals, model building, refinement and R-factor.

Unit V

Protein Engineering: Protein sources, Industrial and medical application of proteins, different expression of proteins for large scale purifications, protein engineering strategy, rational and random mutagenesis. Applications of protein engineering-protein in Chemical and Medical Industries: Generation of heat stable, pH stable enzymes, application in vaccine development, drug development, sensor development.

References

1. Gupta, P.K. 2004. Biotechnology and Genomics. First edition. Rastogi Publications, Meerut.
2. Miglani, G.S. 2007. Advanced Genetics. New Delhi: Narosa Publishing House.
3. Primrose, S.B. and Twyman, R.M. 2006. Principles of Gene Manipulation and Genomics. Blackwell Publishing, Australia.
4. Singh, B.D. 2009. Biotechnology: Expanding Horizons. Second Edition. Kalyani Publishers, Ludhiana.
5. Singh, B.D. 2009. Plant Biotechnology. Kalyani Publishers, Ludhiana.
6. Thompson, J.D., Schaeffer-Reiss, C., and Ueffing, M. 2008. Functional Proteomics. Methods and Protocols. Humana Press, New York.
7. Twyman, R.M. 2004. Principles of Proteomics. Taylor & Francis.

Course Code	Course Title	L	T	P	C
20216RMC26	Research Methodology	3	0	0	2

AIM:

- The course is to understand the principles and applications of classical and modern techniques in Biology develop skill in preparation of reports, writing research communications and thesis

OBJECTIVES:

- To impart understanding on the concepts of statistics and to improve the Computing knowledge of the statistical methods related to environment

COURSE OUTCOMES:

CO1- Understanding research questions and tools

CO2- Experience in scientific writings

CO3-Practice in various aspects of scientific publications

CO4-Inculcation of research ethics

Unit I

Research Selection of problem-stages in the execution of research: choosing a topic to publication- preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, Bibliography. Journal ; standard of research journals – Impact factor.

Unit II:

Statistical method -Measures of dispersion: Universe and population – delimiting population – sampling method – random sampling, stratified random sampling – types of variables: qualitative and quantitative variables – continuous and discontinuous variables – scaling method S- mean – standard deviation – standard error – coefficient of variation.

Unit III

Comparison of means, chi-square test, student test (ANOVA – partitioning of variation). F test – model sums on one way ANOVA with interpretation of data – introduction to MANOVA – Statistical and their use – significance test and fixing levels of significance – use of statistical software like COSTAT and STATISTICA. Brief introduction to pie and histograms. Use of LCD.

UNIT IV:

Chromatography – principle, operative technique and applications of paper, TLC, adsorption chromatography, GLC and HPLC. Ion-Exchange, molecular sieve, Electrophoretic techniques – principle and technique of gel, SDS, high voltage and discontinuous electrophoresis, Isoelectric focusing, pulsed field gel electrophoresis and capillary electrophoresis. Spectrometry – Centrifugation techniques.

UNIT V:

X-Rays – X-Ray diffraction, crystals and detectors, quantitative analysis and applications. Radio chemical methods – Basic concepts, counting methods and applications. Autoradiography, detection and measurement of radioactivity, applications of radioisotopes in biology.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	C. R. Kothari	Research Methodology	2 nd / 2004	New age international publishing (p) Ltd.
2.	S. Rajkumar	Research Methodology	1 st / 2008	Anuradha Publication
3.	Jerrold H. Zar	Biostatistical Analysis	4 th /2003	Pearson Education (Singapore) Pte. Ltd.
4.	D. J. Homie and Hazel Peck	Analytical Biochemistry	3 rd / 1998	Longman group

References

1. An introduction to practical biochemistry by David T. Plummer.
2. Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2nd Edition 1999.
3. Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3rd 1999.
4. Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2nd edition, Pp 160, ISBN: 081208005
5. Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plgrave Macmillan, Pp256. ISBN 1403905843.

SEMESTER III

Course Code	Course Title	L	T	P	C
20216SEC31	Microbial Genetics	6	1	0	6

AIM

- The emergence of molecular genetics has revolutionized large areas of modern biological and biochemical research work it has had a huge impact on the biotechnology industry.

OBJECTIVE

- To extend the knowledge on molecular basis of mutation at microbial level
- To focus on gene regulation and expression mechanisms
- To understand the principles role of plasmids and gene transfer methods

OUTCOME

CO1- Understood genome organization of model organisms.

CO2 - Learn molecular mechanisms that underlie mutations.

CO3- Study about transformation,transduction and conjugation.

CO4- Are able to describe the nature of the transposable elements

Unit I

Trends in Gene discovery. Nucleic acids as genetic information carriers: concept of gene – allele, cistron, replicon – origin of mutation – mutagens – physical, chemical and biological agents. Induced mutation types – mechanisms of mutation induction – suppression of mutations – Intergenic and intragenic suppression.

Unit II

Transformation- Griffith experiments, natural or artificial competence transformation in *Bacillus*, *E. coli*, *Haemophilus* and *Streptococcus* – mechanism of recombination – genetic mapping.

Unit III

Bacterial conjugation – F plasmid – structure and functions. Origin of Conjugation – Hfr and F' strains. Interrupted and uninterrupted mating – time map and recombination map. Conjugation in *E. coli*, *Pseudomonas*. Plasmids, F-factors description and their uses in genetic analysis. Colicins and col factors.

Unit IV

Transduction – generalized and specialized transduction – P1 phage – mechanism of gene transfer through lambda and P1 phages. HFT and LFT lysate. Co- transduction – transduction mapping.

Unit V

Regulation of bacterial gene expression – Operon model – lac, ara, trp and his operons, operon concept, catabolite repression, instability of bacterial RNA, positive and negative regulation, inducers and co-repressors. Attenuation – lac and trp operons; Human genetics: pedigree Analysis, Genetic disease through gene map, Micro array techniques, Single nucleotide polymorphisms (SNPs)

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Larry Snyder, Wendy Champness	Molecular Genetics of Bacteria	1997	American society of Microbiology
2.	David Freifelder	Molecular Biology	2 nd /1990	Narosa Publishing House
3.	William S. Klug, Michael R. Cummings	Concept of Genetics	7 th /2003	Pearson Education(Singapore) Pte. Ltd.

References

1. Siger, M., Berg, P. (1991). Genes and Genomes, University Science Book.
2. Snustad, D., Simmons, J. and Jenkins, B. (1997). Principles of Genetics, First edition, John Wiley and Sons.
3. Watson, J.D., Hopkins, N.H., Roberts, J.W., Stietz, J.A. and Weiner, A.M. (1998). Molecular biology of the gene, 4th edition, Benjamin / Cummings Publishing Company.

Course Code	Course Title	L	T	P	C
20216SEC32	Microbial Biotechnology	6	1	0	6

AIM

To understand the gene and its role in genetic engineering aspects

OBJECTIVES

- To learn the basic principles of nucleic acid and recombinant technology.
- To understand the relationships between molecule/cell level phenomena.
- Studying the concepts and mechanism of central dogma.

COURSE OUTCOME

CO1- Developed an understanding in recombinant DNA technology.

CO2- candidate to recollect the basics of Molecular Genetics and apply a cognitive thinking.

CO3-Possibilities ranging from the treatment of human diseases to develop novel medicines

Unit I:

Nucleic acids – Types- DNA, RNA- structures, functions. Vectors – plasmids (Ti plasmids, pBR322, pSC101, pUC), cosmids, bacteriophages- Structures and functions. DNA replication- process,enzymology and inhibitors of replication. Enzymes-DNA polymerases, RNAses, Ligases, Taq polymerases, Topoisomerases-uses and applications. DNA damage-Types (deamination,oxidative damage, alkylation, pyrimidine dimmers. Repair mechanisms.

Unit II:

Gene-definition, concepts, structure and functions. Cloning techniques, Genomic library. RAPD, RFLP, AFLP and SSR marker in molecular studies and its application. Principles and techniques of Nucleic acid hybridization, protein sequencing and blotting techniques, PCR, DNA fingerprinting.

Unit III:

Biotechnology-Definitions, Concepts and Scope, History and achievements. Screening for products from microorganisms – Inoculum development – Long term preservation of microbes. Biological approaches in microbial production of aminoacids, organic acids, antibiotics, vitamins, steroids and sterols.

Unit IV:

Strain improvement – Applications of mutation, Recombination and DNA Technology. Recombinant DNA Technology – Principles and applications, enzymology of process. Restriction enzymes – Types, recognition sites and specificity.

Unit V:

Biotransformation – Strategies and techniques involved in the process. Immobilization methods – advantages, immobilization production of Mabs. Insulin, somatotropin, IFNs, Vaccines by cloning. Microalgal biotechnology – Dunaliella, Biotechnological potentials of microalgae as food, feed, fuel and pharmaceuticals.

Text Books:

1. Benjamin, L (1990). Gene. IV Edn. Oxford Univ. Press, Oxford.
2. Berg. M.M. and Howe, M.M(1989). Mobile DNA. American society for Microbiology, Washington D.C.
3. Brown, T.(1991) Essential Molecular Biology – A Practical approach. Vol.I
Vol II Oxford Univ. Press. Oxford.

Course Code	Course Title	L	T	P	C
20216SEC33L	Microbial Genetics and Biotechnology Lab	0	0	5	3

AIM:

- To facilitate the students to know the biotechnological aspects in plant growth and improvement.

OBJECTIVES

- Genetic laboratory course to introduce the students to learn about prokaryotic and eukaryotic genetic system using modern techniques.

OUTCOMES

- This course will provide to this students about the mechanics of experimentation methods of genetics.

Experiments

- Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
- Isolation of chromosomal DNA from bacteria by Agarose gel electrophoresis.
- Development of competent cells in *E. coli*.
- Separation of protein by SDS PAGE
- Isolation of antibiotic resistant auxotrophic mutants.
- Separation of proteins using Column chromatographic techniques (Gel filtration).
- Immobilization techniques – alginate beads.
- Estimation of citric acid and ethanol.

DEMONSTRATION

- Gel Electrophoretic methods.
- UV transillumination

Course Code	Course Title	L	T	P	C
20216SEC34A	Microalgal Technology	5	0	0	4

AIM:

- To facilitate the students to know the tissue culture aspects in crop improvement

OBJECTIVES

- To understand the basic principles of tissue culture technique and its applications

OUTCOMES

- To know the basic technique of tissue cultures
- To produce new plants through this tissue culture
- To gain the knowledge about tissue culture in crop improvements.
- To know the applications of tissue culture in various fields.

Unit I

Introduction - history, scope and concepts of basic techniques in plant tissue culture. Laboratory requirements and organisation. Sterilization-filter, heat and chemical. Media preparation - inorganic nutrients, organic supplements, carbon source, gelling agents, growth regulators and composition of important culture media (MS, White,s and Gamborg's media).

Unit II

Cell, tissue and organ culture - Isolation of single cells, selection and types of cells, tissue explants and organs for culture - paper, raft nurse technique, plating method, microchamber techniques, cell suspension cultures - batch, continuous, chemostat culture - synchronization of suspension culture, cellular totipotency, cytological, cytochemical and vascular differentiations - totipotency of epidermal and crown – gall cells.

Unit III

Micropropagation - clonal propagation of elite germplasm, factors affecting morphogenesis and proliferation rate, technical problems in micropropagation. Organogenesis - formation of shoots and roots - role of growth regulators and other factors, somaclonal and gametoclonal variations. Somatic embryogenesis - Process of somatic embryogenesis, structure, stages of embryo development, factors affecting embryogenesis, synthetic seeds.

Unit IV

Haploid production - androgenesis, gynogenesis - techniques of anther culture – segmentation pattern in microspore - isolated pollen culture - plantlets from haploids - diploidisation - factors influencing androgenesis, haploidy through gynogenesis, haploid mutants, utilization of haploids in plant breeding. Protoplast culture: Isolation of protoplasts - mechanical and enzymatic sources, culture of protoplasts, viability. Protoplastfusion - spontaneous, mechanical, induced electrofusion, selection of somatic hybrids, cybrids, importance.

Unit V

Cryopreservation and gene bank - Modes of preservation, preparation of materials for deep freezing, cryoprotectors, storage strategies, assessment of successful cryopreservation, application and limitations. Application of tissue culture in forestry, horticulture, agriculture and

pharmaceutical industry, transgenic plants.

REFERENCES

1. Bhojwani, S.S. and Razdan, M.K. (1983). *Plant Tissue Culture: Theory and Practice*. Elsevier Science Publishers, Netherlands.
 2. Dodds, J.H. and Roberts, I.W. (1985). *Experiments in Plant Tissue Culture*. Cambridge University Press, UK.
 3. Fowler, M.W. (1986). *Industrial Application of Plant Cell Culture*. In: Yeoman, M. M. (ed.). *Plant Cell Culture Technology*. Blackwell, Oxford, London.
 4. Hammoond, J., McGarvey, P. and Yusibov, V. (2000). *Plant Biotechnology*. Springer Verlag, New York.
 5. Johri, B.M. (1982). *Experimental Embryology of Vascular Plants*. Narosha Publishing House, New Delhi.
 6. Kalyan Kumar, De (1992). *An Introduction to Plant Tissue Culture*. New Central Book Agency, Calcutta.
 7. Ramawat, K.G. (2000). *Plant Biotechnology*. S. Chand and Co. Ltd., New Delhi.
 8. Razdan, M.K. (2004). *Introduction to Plant Tissue Culture* (2nd ed.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
 9. Reinert, J. and Bajaj, Y.P.S. (1977). *Plant Cell Tissue and Organ Culture: A Laboratory Manual*. Narosa Publishing House, New Delhi.
- Vasil, I.K. (1986). *Cell Culture and somatic Cell Genetics of Plants* (3 Volumes). Academic Press Inc.

Course Code	Course Title	L	T	P	C
20216SEC34B	Nanotechnology	5	0	0	4

Aim

To understand about nanotechnology principles and its applications

Objective:

To gain knowledge about Nanotechnology and its commercial promise

Outcomes:

To understand the basic principles and method of Nanotechnology

To know the applications of Nanotechnology

To understand the groundbreaking innovations in medicine and medical implants, environment and other field

Unit I: Introduction to bionanotechnology

Milestones in History – bionanotechnology – concept and future prospects – application in Life Sciences. Terminologies – nanotechnology, bionanotechnology, nanobiomaterials, biocompatibility, nanomedicine, nanowires, quantum Dots, nanocomposite, nanoparticles, nanosensors. Biotechnology to bionanotechnology, natural bionanomachines. Current status of bionanotechnology.

Unit II: Synthesis of nanoparticles

Molecular nanotechnology – nanomachines – collagen. Uses of nanoparticles – cancer therapy – manipulation of cell and biomolecules. Cytoskeleton and cell organelles. Types of nanoparticles production – physical, chemical and biological. Microbial synthesis (bacteria, fungi and yeast) of nanoparticles – mechanism of synthesis.

Unit III: Types of nanoparticles and methods of characterization

Nanoparticles – types, functions – Silver, Gold and Titanium. Physical and chemical properties of nanoparticles. Characterization of nanoparticles – UV-Vis spectroscopy, particle size analyzer, Electron Microscopy – HRTEM, SEM, AFM, EDS, XRD. Other tools and techniques required for bionanotechnology: rDNA technology, site directed mutagenesis, fusion proteins, X-Ray crystallography, NMR. Bioinformatics: molecular modeling, docking, computer assisted molecular design.

Unit IV: Applications of bionanotechnology

Drug and gene delivery – protein mediated and nanoparticle mediated. Uses of nanoparticles in MRI, DNA and Protein Microarrays. Nanotechnology in health sectors. Nanomedicines, Antibacterial activities of nanoparticles.

Nanotechnology in agriculture. Toxicology in nanoparticles – Dosimetry.

Unit V: Merits and demerits of nanoparticles

Advantages of nanoparticles – drug targeting, protein detection, MRI, development of green chemistry – commercial viability of nanoparticles. Disadvantages – pollution and health risks associated with nanoparticles.

REFERENCES

1. Parthasarathy BK. Introduction to Nanotechnology, Isha Publication. 2007.
2. Elisabeth Papazoglou and Aravind Parthasarathy. Bionanotechnology. Morgan and Claypool Publishers. 2007.
3. Bernd Rehm. Microbial Bionanotechnology: Biological Self-assembly Systems and Biopolymer-based Nanostructures. Horizon Scientific Press. 2006.
4. David E Reisner and Joseph D Bronzino. Bionanotechnology: Global Prospects. CRC Press. 2008.
5. Ehud Gazit. Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology. Imperial College Press. 2006.
6. Kamali Kannangara. Nanotechnology: Basic science and emerging technologies- Mick Wilson, Overseas Press. 2005.
7. Mark A Ratner and Bandyopadhyay AK. Nano Materials. Nanotechnology: A gentle introduction to the Next Big Idea, New Age Publishers. 2002.
8. Pradeep T. Nano Essentials understanding nanoscience and Nanotechnology. 1st edition. TMH publications. 2007.
9. Parag Diwan and Asish Bharadwaj. Nanomedicines, Pentagon Press. 2006.
10. Vladimir P Torchilin. Nanoparticles as Drug Carriers. Imperial College Press, North Eastern University, USA. 2006.

OPEN ELECTIVE

Course Code	Course Title	L	T	P	C
202ENOEC	Writing for the Media	4	0	0	4

Aim:

- To equip students to enter into the realm of mass media.

Objective:

- To comprehend the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media
- Learn to write for the media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop- Filters- Human interest stories- Recognizing and evaluation news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		
D.S Mehta	Mass Communication & Journalism		

Course Code	Course Title	L	T	P	C
202MAOEC	Applicable Mathematical Techniques	4	0	0	4

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, "Numerical Methods in Science and Engineering" M.K. Venkatraman

Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
202PHOEC	Biomedical Instrumentation	4	0	0	4

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

OUTCOMES:

- Define basic medical terms and physical values that can be handled by medical instrumentation,
- Describe methods and implementation of electrical and nonelectrical medical parameters diagnostic,
- demonstrate measuring of basic medical parameters,
- Calculate basic parameters of the equipment for using in electro diagnostic and electro therapy,
- Apply safety standards and select disposal method and procedures for electrical diagnostic equipment.

UNIT – I: BIO ELECTRIC SIGNALS AND ELECTRODES

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: RECORDING SYSTEM AND RECORDERS

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: MEASUREMENT AND ANALYSIS TECHNIQUES

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: MAGNETIC RESONANCE AND ULTRASONIC IMAGING SYSTEMS

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – medical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: ADVANCED BIO MEDICAL SYSTEMS

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

□

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
202CHOEC	Open Elective-Green Chemistry	4	0	0	2

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
 - To know about the Pollution and its prevention measures.
 - To familiarize the green chemistry.
 - To learn about the bio-catalytic reactions.
 - To understand about the vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Trends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
202CSOEC	M-Marketing	4	0	0	4

OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

OUTCOMES

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

UNIT I : Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II : Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV: Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V: Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, CambridgeUniversity Press, 2001.

Course Code	Course Title	L	T	P	C
202CMOEC	Open Elective- Financial Services	4	0	0	2

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

1. To gain knowledge on financial services.
2. To understand importance of various services including banking, insurance, mutual funds.

OUTCOME

To introduces meaning and functions of Financial Intermediaries

To understand the role of merchant bank and its services

To provide information regarding management of mutual funds and Regulations

To understand the role and functions of financial services Marketing

To know the structure and types of debt Instruments

To realize Foreign Exchange Market

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents-Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview:

Definition-Characterstistics-Objectives-Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market: Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-Major Issues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

REFERENCE BOOKS

1. Gordon , Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

SEMESTER IV

Course Code	Course Title	L	T	P	C
20216SEC41	Pharmaceutical Microbiology	6	1	0	6

AIM

- The information gained will help the students to formulate novel drugs.

OBJECTIVES:

- To facilitate the students to know the definite path of metabolism of drugs and drug discovery

OUTCOMES:

- This course gives information on drug designing, novel techniques in drug discovery and the role of biotechnology in pharmaceuticals.

Unit – 1 Antibiotics and synthetic antimicrobial agents

Antibiotics and synthetic antimicrobial agents, Antifungal antibiotics, antitumor substances. Peptide antibiotics, Chloramphenicol, Sulphonamides and Quinolone antimicrobial agents. Chemical disinfectants, antiseptics and preservatives.

Unit – 2 Mechanism of action of antibiotics

Mechanism of action of antibiotics (inhibitors of cell wall synthesis, nucleic acid and protein synthesis). Molecular principles of drug targeting. Drug delivery system in gene therapy. Bacterial resistance to antibiotics. Mode of action of non – antibiotic antimicrobial agents. Penetrating defenses – How the antimicrobial agents reach the targets (cellular permeability barrier, cellular transport system and drug diffusion).

Unit – 3 Microbial production and Spoilage of pharmaceutical Products

Microbial contamination and spoilage of pharmaceutical products (sterile injectibles, non injectibles, ophthalmic preparations and implants) and their sterilization. Manufacturing procedures and in process control of pharmaceuticals. Other pharmaceuticals produced by microbial fermentations (streptokinase, streptodornase). New vaccine technology, DNA vaccines, synthetic peptide vaccines, multivalent subunit vaccines. Vaccine clinical trials.

Unit – 4 Regulatory practices, biosensors and applications in Pharmaceuticals

Financing R&D capital and market outlook. IP, BP, USP. Government regulatory practices and policies, FDA perspective. Reimbursement of drugs and biologicals, legislative perspective. Rational drug design. Immobilization procedures for pharmaceutical applications (liposomes). Macromolecular, cellular and synthetic drug carriers. Biosensors in pharmaceuticals. Application of microbial enzymes in pharmaceuticals.

Unit – 5: Quality Assurance and Validation

Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) in

pharmaceutical industry. Regulatory aspects of quality control. Quality assurance and quality management in pharmaceuticals ISO, WHO and US certification. Safety in microbiology laboratory.

BOOKS/REFERENCE

1. Pharmaceutical Microbiology – Edt. by W.B.Hugo & A.D.Russell Sixth edition. Blackwell scientific Publications.

Course Code	Course Title	L	T	P	C
20216SEC42	Biostatistics and Bioinformatics	6	1	0	6

Unit I – Definitions

Scope of Biostatistics, probability analysis – variables in Biology, collection, classification and tabulation of data – Graphical and diagrammatical representation – scale diagrams – Histograms – frequency polygon – frequency curves. Measures of central tendency – arithmetic Mean, Median and Mode – calculation of mean, median, mode in series of individual observations, discrete series, continuous open – end classes. Measure of dispersion – Standard Deviation and Standard curves, Measures of central tendency on Variance.

Unit II – Correlation and regression

Simple correlation – Correlation coefficient – Regression simple linear regression. Basic ideas of significance test – Hypothesis testing level of significance – Test based on student ‘t’ ‘chi’ square and goodness of fit. ‘F’ test – ANOVA.

Unit III – Databases

Biological resource databases – Examples and application – Sequence Analysis – protein and nucleic acid.

Unit IV – Genomics and proteomics

Sequencing genomes – sequence assembly – genome on the web – annotating and analyzing genome sequences. Proteomics pathway databases.

Unit V – Sequence analysis

Pair wise sequence comparison, protein data bank, SWISS-PROT, Genbank – sequence queries against biological databases – BLAST and FASTA – multifunctional tools for sequence analysis, multiple sequence alignments, phylogenetic alignment – profiles and motifs.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	D.R. Westhead, J. Howard Parish and Richard M. Twymans	Bioinformatics	1 st /2003	Viva Books Private Limited
2.	S. Sundara Rajan, R. Balaji	Introduction to Bioinformatics	1 st /2002	Himalaya Publishing House
3.	Rashidi, H.H. and Bvehler, L.K	Bioinformatics Basics: Applications in Biological Science and Medicine	2002	CRC Press, New York.

References

1. Cynthia Gibas and Per Jambek (2001) Developing Bioinformatics Computer Skills, Shroff Publishers and Distributions Pvt. Ltd., O'reilly, Mumbai.
2. Misener, S. and Krawetz, S.A. (2000). Bioinformatics Methods and protocols, Human Press Totowa, New Jersey.
3. Rashidi, H.H. and Bvehler, L.K. (2002). Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, New York.
4. Cynthia Gibas and Per Jambek (2001) Developing Bioinformatics Computer Skills, Shroff Publishers and Distributions Pvt. Ltd., O'reilly, Mumbai.
5. Misener, S. and Krawetz, S.A. (2000). Bioinformatics Methods and protocols, Human Press Totowa, New Jersey.

Course Code	Course Title	L	T	P	C
20216SEC43L	Pharmaceutical Microbiology Lab	5	0	0	4

Aim

To provides knowledge and understanding with regards to the significance of the presence of bacteria, yeasts, moulds, viruses and toxins in **pharmaceutical** raw materials, intermediates, new products and **pharmaceutical** production.

Objective

Culture and identification of important human pathogens, microbial growth conditions, effect of antimicrobial agents, development of resistance against antimicrobial agents, sterilization and disinfection, bacterial virulence factors, production and control of vaccines.

Course outcome

CO1 - Aseptic condition relevance to healthcare and the pharmaceutical industry.

CO2 - Knowledge and understanding of the practical aspects of pharmaceutical microbiology.

CO3 - Perform practicals on antimicrobial activity

CO4- Learn the production of antibiotics from microbes.

Lab Work

1. Introduction to equipment and glassware used in microbiology laboratory (BOD, Incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, etc.,)
2. Study of morphology of different microbes
3. Preparation of various culture media (Determination of microbial colony characteristics)
4. Isolation of pure cultures by streak plate, spread plate & pour plate techniques.
5. Enumeration of bacteria by direct microscopic count.
6. Motility test by Hanging drop method
7. Microbiological assay of antibiotics by cup plate method and other methods
8. Characterization of microbes through Bio chemical reactions (IMViC)
9. Evaluation of any disinfectant by phenol coefficient test
10. Study of Oligodynamic action (of metals on bacteria)
11. Preservation of microorganisms (slant and stab cultures)
12. Sterility testing of Pharmaceuticals
13. Microbiological Analysis of Water.
14. Production of antibiotics using microbes

Course Code	Course Title	L	T	P	C
20216SEC44A	Bioethics and IPR	5	0	0	4

Aim

To understand the basic principles of Bioethics and IPR

Objective

Students will gain awareness about Bioethics and Intellectual Property Rights (IPRs) to take measure for the protecting their ideas

Outcome

To know about Bioethics and Intellectual Property Rights (IPRs)

They will able to devise business strategies by taking account of IPRs

They will be able to assists in technology upgradation and enhancing competitiveness.

They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health

They will gain more insights into the regulatory affairs.

Unit I

Bioethics Concept, philosophical considerations, epistemology of science, ethical terms, principles and theories and relevance to biotechnology. Ethics and the law issues - genetic engineering, stem cells, cloning, medical techniques, transhumanism and bioweapons. Research concerns - animal rights, ethics of human cloning, reproduction and stem cell research.

Unit II

Emerging issues - biotechnology's impact on society, DNA on the witness stand and use of genetic evidence in civil and criminal court cases. Challenges to public policy, regulations, improving public understanding of biotechnology products to correct misconceptions.

Unit III Introduction to IPR & Legal Protection

Basics of patents, types of patents, Indian Patent Act 1970, recent amendments, filing patent application, precautions before patenting – disclosure and non-disclosure. WIPO treaties, Budapest treaty, PCT and implications, role of a country patent office and procedure for filing a PCT application. Types of IP - patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications and international framework for the protection of IP. Introduction to history of GATT, WTO, WIPO and TRIPS. Global scenario of patents and Indian position, patenting of biological materials. IP as a factor in R&D and IP relevance to Biotechnology.

Unit IV Patent Filing and Infringement

Patent application - forms and guidelines, fee structure and time frames. Types of patent applications, provisional and complete specifications, PCT and convention patent applications. International patenting - requirement, procedures and costs. Financial assistance for patenting and introduction to existing schemes. Publication of patents -gazette of India, status in Europe and US. Patenting by research students, lecturers and scientists. University/organizational rules in India and abroad, credit sharing by workers and financial incentives. Patent infringement - meaning, scope, litigation, case studies and examples.

Unit V Biosafety

Introduction and historical background. Introduction to biological safety cabinets, primary containment for biohazards, biosafety levels, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals. Biosafety guidelines by Government of India. Definition of GMOs and LMOs. Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO's applications in food and agriculture. Environmental release of GMOs, risk assessment; risk management and communication. Overview of national regulations and relevant international agreements including Cartagena protocol.

Important Links

1. Bioethics - by Ellen Frankel Paul, Fred D. Miller, Jeffrey Paul, Fred Dycus
Miller Cambridge University Press, 2002.
2. Bioethics & Science, John A. Bryant, Linda Baggott la Velle, John F. Searle
- 2002.
3. <http://www.w3.org/IPR/>
4. <http://www.wipo.int/portal/index.html.en>
5. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
6. www.patentoffice.nic.in

Course Code	Course Title	L	T	P	C
20216SEC44B	Molecular Immunology	5	0	0	4

Aim:

- This subject considers immune responses at the molecular level and covers the role of immune receptors on immune cells in the initiation of immune responses

Objective:

- To understand the immune response in molecular level

Outcome

- To describe the structure and function of immunological receptors and apply this information towards building a comprehensive understanding of the initiation of immune responses at the molecular level
- To describe the various stages of immune cell development and compare this with abnormal development in a range of immunodeficiency conditions
- To explain how immunoregulation occurs and relate it to the overall function of the immune system in the healthy host as well as in immune disease states

Unit I Fundamental Concepts and Anatomy of the Immune System

Terminology – Antigen, immunogen, hapten, allergen, tolerogen, super antigens, antibody, immunoglobulin, antigenicity, immunogenicity. Self & nonself, innate & acquired immunity. Haematopoiesis. Organs, tissues, cells and mediators of immune system - primary lymphoid organs, secondary lymphoid tissues, lymphocytes, cytokines and lymphokines. Lymphatic system, lymphocyte circulation and lymphocyte homing. Mucosal and Gut associated lymphoid tissue (MALT&GALT) and mucosal immunity. Principles of cell signaling.

Unit - II Immune Responses Generated by B and T lymphocytes

B cell: B cell development, maturation, activation and differentiation. B cell receptor and determinants. B cell subsets. Immunoglobulins - basic structure, classes & subclasses of immunoglobulins, antigenic determinants, multigene organization of immunoglobulin genes and immunoglobulin super gene family. Generation of antibody diversity.

T cell: T cell development, maturation, activation and differentiation. T cell receptor and determinant. T cell subsets. TCR complex. Antigen processing and presentation - endogenous antigens, exogenous antigens, non-peptide bacterial antigens Cell to cell co-operation and hapten-carrier system.

Unit - III Immune Response

Recognition & response: Non specific and Specific. **Nonspecific:** Natural built-in barrier, phagocytosis. Complements, natural killing, inflammatory response. **Specific:** HI & CMI. Antigen recognition and response. Major Histocompatibility Complex - MHC genes, MHC in immune responsiveness and disease susceptibility. HLA typing. Kinetics of immune response and memory. **Unresponsiveness:** tolerance, suppression and potentiation.

Unit - IV Vaccinology

Active, passive and combined immunization. Live, killed, attenuated, plasma derived, sub unit, recombinant DNA, protein based, plant-based, peptide, anti-idiotypic and conjugate vaccines – production & applications. Role and properties of adjuvants & ISCOMS. Antibody genes and antibody engineering - chimeric and hybrid monoclonal

antibodies, catalytic antibodies and generation of immunoglobulin gene libraries.

Unit - V Clinical Immunology

Immunity to infection, bacteria, viral, fungal and parasitic infections (with examples from each group). Hypersensitivity – Type I, II, III and IV. Autoimmunity and types of autoimmune diseases. Mechanism and role of CD4⁺ T cells, MHC and TCR in autoimmunity. Treatment of autoimmune diseases. Transplantation – immunological basis of graft rejection, clinical transplantation and immunosuppressive therapy. Tumor immunology, tumor antigens, immune response to tumors and tumor evasion of the immune system. Cancer immunology and immunotherapy. Immunodeficiency - primary immuno - deficiencies, acquired or secondary immuno - deficiencies.

Text Books

1. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2011. Essential Immunology 12th Edition. Wiley - Blackwell.
2. Charles A Janeway, Jr. Paul Travers, Mark Walport, and Mark J Shlomchik. 1999. Immunobiology. 4th Edition. Journal of Current Biology publications.
2. D. M. Weir and John Stewart. 1997. Immunology. 8th Edition. Churchill Livingstone.
3. P.J.Delves, I S.J.Artin, I D.R.Burton and I.M.Roitt. 2006. Essential Immunology. 11th Edition. Wiley - Blackwell.
4. Richard M. Hyde. 2012. Microbiology and Immunology. 3rd Edition. Springer Science & Business Media.

Reference Books

1. Brostoff J, Seaddin JK, Male D and Roitt IM., 2002. Clinical Immunology. 6th Edition. Gower Medical Publishing.
2. Paul William E. 1999. Fundamental of Immunology. 4th Edition. Lippencott Raven.
3. E Roitt. 2011. Essential Immunology. 12th Edition. Blackwell Publication.



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SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF ENGLISH

2021 – 2022

EMPLOYABILITY

SKILL DEVELOPMENT

ENTREPRENEURSHIP

EMPLOYABILITY/ SKILL DEVELOPMENT

BA ENGLISH- REGULATION 2020

COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	L	T	P	C
THEORY					
22110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I)	4	0	0	2
20111AEC12	English-I	4	0	0	2
20111AEC13	Literature in 1400-1600 Period	5	0	0	3
20111AEC14	Literature in Elizabethan Period	5	0	0	3
20111AEC15	Social History of England-I	4	0	0	3
20111AEC16	History of English Literature-I	5	0	0	4
	Total				17
AUDIT COURSE					
201ACLSICN	Indian Constitution	-	-	-	2
201ACLSUHV	Universal Human Values	-	-	-	2

SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
20111AEC22	English-II	4	0	0	2
20111AEC23	Literature in Jacobean Period	5	0	0	3
20111AEC24	Literature in Restoration Period	5	0	0	4
20111AEC25	Social History of England-II	4	0	0	3
20111AEC26	History of English Literature-II	5	0	0	4
RESEARCH SKILL BASED COURSE					
20111RLC27	Research Led Seminar	-	-	-	1
	Total				19
AUDIT COURSES					
201ACLSCOS	Communication Skills	-	-	-	2
201ACSSBE	Basic Behavioral Etiquette	-	-	-	2

SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20111AEC31/ 20132AEC31/ 20135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
20111AEC32	English-III	4	0	0	2
20111AEC33	Literature in Augustan Period	4	0	0	3
20111AEC34	Literature in Romantic Period	4	0	0	3
20111SEC35	Literary Forms and Prosody	5	0	0	4
20111AEC36	Shakespeare	4	0	0	3
RESEARCH SKILL BASED COURSE					
20111RMC37	Research Methodology	2	0	0	2
	Total				19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20111SEC43	Language and Linguistics	4	0	0	3
20111AEC44	Literature in Victorian Period	4	0	0	3
20111AEC46	Literary Criticism	5	0	0	4
20111AEC47	Indian and European Classics in Translation	4	0	0	3
201ENSTU45	Environmental Studies	2	0	0	2
	Total				19
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability				2

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
20111AEC51	Literature in Modern Period-I	5	0	0	3
20111AEC52	American Literature	5	0	0	3
20111SEC53	English Language Teaching	5	1	0	5
20111SEC54	Translation	5	1	0	4
20111DSC55_	Discipline Specific Elective – I	5	0	0	3
RESEARCH SKILL BASED COURSE					
20122BRC57	Participation in Bounded Research	-	-	-	1
	Total				19
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2

SEMESTER – VI

Course Code	Course Title	L	T	P	C
THEORY					
20111AEC61	Literature in Modern Period-II	5	0	0	4
20111AEC62	Indian Writing in English	5	0	0	4
20111AEC63	Commonwealth Literature	5	1	0	5
20111DSC64_	Discipline Specific Elective –II	5	0	0	3
201__OEC(2 Digit Course Name)	Open Elective	4	0	0	2
PRACTICAL					
20112PRW65	Project Work	-	-	-	4
20111PEE	Programme Exit Examination	-	-	-	1
	Total				23
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2
201ACLSCET	Community Engagement	-	-	-	1
Total Credits –Programme					116
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
V	a) 20111DSC55A-Single Author Study-Tagore b) 20111DSC55B- Single Author Study- Charles Dickens c) 20111DSC55C- Single Author Study- Kamala Das d) 20111DSC55D- Single Author Study- R.K.Narayan e) 20111DSC55E- Single Author Study- Leo Tolstoy
VI	a) 20111DSC64A- Study of a genre-Novel b) 20111DSC64B- Study of a genre- One act Play c) 20111DSC64C- Study of a genre-Fiction d) 20111DSC64D- Study of a genre-Short stories e) 20111DSC64E- Study of a genre-Drama



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THANJAVUR – 613 403 - TAMILNADU

Semester I

<p>மேலும் தகவல்கள் பங்களிக்கவும்- வணிக, தஞ்சாவூர் பா. குதியாழி : தமிழ் முன் பருவம் முதலாம் ஆண்டு இக்கலை இலக்கியம் - செட்டியர், சிறுகதை , நாடகம், இலக்கிய வரலாறு அககு : 1. செட்டியர் தாயுமானவ கவாமிசன் - ஆதார புலனம் - சிறும்பு நகரீயம் - 40 அட்டிகள் இராமலிங்க அட்டிகள் - திருவாய்.பா - அருணை விண்ணப்பம் - 40 அட்டிகள் கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மானவயும் - 52 அட்டிகள் பாரதியார் - புதுமைப்பெண் - 40 அட்டிகள் பாரதிதாசன் - பாரதிதாசன் கவிதைகள் , தமிழ் இலிமை , தமிழ் அணவு அககு : 2. செட்டியர் நாமக்கல் அவிதர் - தமிழ் தேள் - தமிழ் வளர்க்க படும் செம்பிளம் , 40 அட்டிகள் ந.சி.சுப்பிரமணியன் - வழிநடாணை - கவிதை கரு.ன் , 42 அட்டிகள் கரதா - தேன்மழை, கம்பை , 22 அட்டிகள் கண்ணதாசன் - இலக்கியம் , ஒரு பாணியின் கதை , 54 அட்டிகள் அட்டிகள் ரமணி - சொந்த சிறுகதைகள் , குடும்பவிய கிளறும் சிறுகதைகள், 80 அட்டிகள் அககு : 3. சிறுகதை க.சுப்பிரமணியம் - வேலில் பழக்க பண அககு : 4. நாடகம் கு. வெ. பாண்டிமணியன் , கெளமிய புத்தர் (அரைநடை நாடகம்) அககு : 5. இலக்கிய வரலாறு சிறுகதை , புதினம், நாடகம் அரைநடை , கவிதை , புதுக்கவிதை</p>
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EMPLOYABILITY

Course Code	Course Title	L	T	P	C
2011AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To enhance vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Learn to edit and do proof reading
- Read and comprehend literature

UNIT – I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Comparison and contrast

Cause and effect

UNIT – IV

Editing

Proof reading

UNIT – V

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

Reference book:

Author	Title of the book	Edition / Year	Publisher
Wren and Martin	English Grammar	2009	S.Chand & Company Ltd
Meenakshi Raman & Sangeetha Sharma	Technical Communication	Second Edition 2011	Oxford University Press
Sudhir Kumar Sharma	The World's Great Speeches	-	Galaxy Publishers

EMPLOYABILITY

Course code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objectives:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcomes:

- Read and comprehend literature
- Appreciate the different types of poetry and prose

UNIT –I

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT – II

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –III

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT –IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –V

Oliver Twist -Charles Dickens

Text book:

Author	Title of the book	Edition / Year	Publisher
S.Murugesan/Dr.K.Chellappan	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC13	Literature in 1400-1600 Period	4	0	0	4

Aim:

- To acquaint with a sweep from the beginning to the summit stage of English Literature

Objective:

- To study the early English poetry fathered by Chaucer, followed by the early Elizabethan poets and the beginning of English prose and drama

Outcome:

- Understand British Literature from 1400-1600 period
- Explain the connections between their own experiences and the world using the texts

UNIT I

The Prologue to Canterbury Tales-The Prioress, The Wife of Bath, The Parson-Chaucer

UNIT II

Epithalamion -Spenser

UNIT III

Prothalamion -Spenser

UNIT IV

Essays - Of Friendship, Of Studies -Bacon

UNIT V

Spanish Tragedy -Thomas Kyd

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC14	Literature in Elizabethan Period	4	0	0	4

Aim:

- To acquaint with the different forms of literature during Elizabethan period

Objective:

- To study the different sonnet forms, 'humor' comedy, Shakespearean tragedy and early prose literature during Elizabethan period
- To learn to appreciate the different forms of literature during Elizabethan period

Outcome:

- Explore British Literature in Elizabethan period
- Interpret the texts

UNIT I

Astrophel & Stella -Sidney

UNIT II

Sonnets -Shakespeare

UNIT III

Unfortunate Traveller -Thomas Nashe

UNIT IV

Alchemist -Ben Jonson

UNIT V

Othello -Shakespeare

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC15	Social History of England-I	5	0	0	4

Aim:

- To acquaint with a total picture of the English society for a better understanding

Objective:

- To know the socio-economic aspects from fourteenth century to eighteenth century

Outcome:

- Learn the social background of British literature from 1400 to Puritan England
- Introduce about English life which have shaped English society

UNIT I

The age of Chaucer-Political history, London, Feudalism and the manor, Black Death, Peasants' Revolt, John Wycliffe, Literature

UNIT II

The fifteenth century- Political history, War of Roses, Landlords and tenants, London, Manor houses, Nunneries, Education, William Caxton, Literature

UNIT III

Renaissance
Reformation

UNIT IV

Shakespeare's England-Political history, Social life, Education

UNIT V

Puritan England- Political history, Colonial expansion, Social life, Religion, Literature

Text book:

Author	Title of the book	Edition / Year	Publisher
G.M Trevelyan	English Social History	2011	Surjeeth Publications

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
2011AEC16	History of English Literature-I	5	0	0	4

Aim:

- To acquaint with the literary background for a better understanding

Objective:

- To know the literary background from fourteenth century to seventeenth century
- To understand the biographies of different writers

Outcome:

- Understand the literary background of British Literature from Chaucer's age to Dryden's age
- Know about author's biography

UNIT I

The age of Chaucer
Fifteenth century literature

UNIT II

The age of Shakespeare-I

UNIT III

The age of Shakespeare-II

UNIT IV

The Caroline age
The age of Milton

UNIT V

The age of Dryden

Text book:

Author	Title of the book	Edition / Year	Publisher
Hudson	History of English Literature	2012	Maple Press

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

Aim

- To understand the salient features of the Indian Constitution

Course Objectives:

- To make the students understand about the democratic rule and parliamentary administration
- To appreciate the salient features of the Indian constitution
- To know the fundamental rights and constitutional remedies
- To make familiar with powers and positions of the union executive ,union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Course outcome:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights are established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.
- 3) Markandan. k.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

Introduction: What is love? Forms of love—forself, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living

Love and compassion and inter-relatedness

Love, compassion, empathy, sympathy and non-violence

Individuals who are remembered in history for practicing compassion and love.

Narratives and anecdotes from history, literature including local folklore

Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?

Sharing learner's individual and/or group experience(s)

Simulated Situations

Casestudies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)

- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit III

Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence

Ahimsa as non-violence and non-killing

Individuals and organisations that are known for their commitment to non-violence

Narratives and anecdotes about non-violence from history, and literature including

local folklore

Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?

- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Casestudies

Unit IV

Introduction: What is righteousness?

Righteousness and *dharma*, Righteousness and Propriety

Individuals who are remembered in history for practicing righteousness

Narratives and anecdotes from history, literature including local folklore

Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?

Sharing learners' individual and/or group experience(s)

Simulated situations

Casestudies

Unit V

Introduction: What is peace? Its need, relation with harmony and balance

Individuals and organisations that are known for their commitment to peace

Narratives and Anecdotes about peace from history, and literature including local folklore

Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?

Sharing learner's individual and/or group experience(s) about peace

Simulated situations

Casestudies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Casestudies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and Ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER – II

மேன். இலக்கியப் பரீட்சைக்கழகம் - வாய்ப்பு, தஞ்சாவூர்
பாட. குறியீடு : தமிழ் இலக்கியப் பருவம்
முதலாம் ஆண்டு
செய்தல் , பத்தி இலக்கியம், சிறு இலக்கியம் , இலக்கிய வரலாறு

பகுதி : 1 . செய்தல் :

1. திருமுறைப்பற்றல் வேலைகள் - வேளாறு பதிவுகள்
2. திருமுறைப்பற்றல் வேலைகள் - தனித் திருமுறைகள்
3. சிறுமுறை வேலைகள் - திருமுறைகள் தனி மறை
4. மானிக்க வகைகள் - திருமுறைகள் - திருமுறைகள் மறை

பகுதி : 2 . செய்தல் :

5. குறியீடுகள் - பெருமை திருமுறை
6. நம்புதல் திருமுறை பெருமை - இலக்கியப் பற்றல் - மானிக்க வகைகள்
7. ஆண்டுகள் - மானிக்க திருமுறை - திருமுறைகள் மறை
8. திருமுறை ஆண்டுகள் - சிறிய திருமுறை

பகுதி : 3 . செய்தல் :

- 9 . திருமுறை - மறைகள் திருமுறை
- 10 . குறியீடுகள் - மானிக்க வகைகள் மறை - தமிழ் வகுமைப் பருவம்
- 11 . திருமுறைப்பற்றல் வேலைகள் - குறியீடுகள் மறை - குறியீடு மறை மறை
- 12 . திருமுறைப்பற்றல் - திருமுறைப்பற்றல் மறை

பகுதி : 4 . பதிவுகள்

- 13 . கு. பெ. மறைப்பற்றல் - மறை

பகுதி : 5 . இலக்கிய வரலாறு

- 14 . மறை மறை இலக்கியங்கள் , சிறு இலக்கியங்கள் , (பற்றல் - மறைப்பற்றல் , பற்றல்)

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop technological skill
- Able to write in a variety of formats
- Read biographies and develop personality

UNIT – I

E-mail

Fax

Memos

UNIT – II

Itinerary

Checklist

UNIT – III

Invitation

Circular

UNIT – IV

Instruction

Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

Text Book

Author	Title of the book	Edition / Year	Publisher
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Rajendra Pal & J.S.Korlahalli	Business Communication	2015	Sultan

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC22	English II	5	0	0	3

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Acquire language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology -A.K. Ramanujan

Gift -Alice Walker

The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans

Asleep -Ernst Jandl

Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas

I Have a Dream -Martin Luther king

Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe

The Fortune Teller -Karel Capek

Proposal -Anton Chekov

Text book:

Author	Title of the book	Edition / Year	Publisher
Gowri Sivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC23	Literature in Jacobean Period	5	0	0	3

Aim:

- To know the English literary history in Jacobean Period

Objective:

- To learn British Literature in Jacobean period

Outcome:

- Examine the writers of Jacobean period
- Provide information about the social and literary issues of Jacobean period

UNIT I

Valediction Forbidding Mourning - John Donne

The Retreat - Henry Vaughan

UNIT II

The Pulley - George Herbert

The Garden - Andrew Marvell

UNIT III

L'Illegro - John Milton

Il penseroso - John Milton

UNIT IV

Dutchess of Malfi - Webster

UNIT V

The Shoemaker's Holiday - Dekker

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC24	Literature in Restoration Period	5	0	0	4

Aim:

- To acquaint with the socio, religious aspects of the Restoration period

Objective:

- To learn how the literary world had rebelled against the preceding period and how it finds expression in the literature of the Restoration period.

Outcome:

- Interpret and explain the connections between their own experiences and the world using the texts
- Gain knowledge about the contributions of writers in Restoration period

UNIT I

Mac Flecnoe -Dryden

UNIT II

The Pilgrim's Progress -John Bunyan

UNIT III

All for Love -Dryden

UNIT IV

School for Scandal -Sheridan

UNIT V

The Way of the World -William Congreve

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC25	Social History of England-II	4	0	0	3

Aim:

- To acquaint with a total picture of the English society for a better understanding

Objective:

- To know the socio-economic aspects from nineteenth century to the present age

Outcome:

- Analyse the social background of British literature from eighteenth century to present age
- Give an overview of social and cultural change vital to the development of English social identities

UNIT I

Restoration England-Political history, Religion, Commerce and industry, Social life, Morals and manners, Philosophy and science, Literature

UNIT II

Eighteenth century England- Political history, Colonial expansion, Religion, Social life, Literature, Agrarian revolution, Industrial revolution

UNIT III

The French Revolution and Cobbett's England-French revolution, The Machine age, Social life, William Cobbett, age of Romanticism

UNIT IV

The Victorian England - Political history, An Era of reform, Social life, Science and industry, Transport and communication, Religion, Literature

UNIT V

Twentieth century England- Political history, Social life, Education, Liberal reforms, Labour problem, World Wars, Literature

Text book:

Author	Title of the book	Edition / Year	Publisher
G.M Trevelyan	English Social History	2011	Surjeeth Publications

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC26	History of English Literature-II	5	0	0	4

Aim:

- To acquaint the students with the literary background of different ages for a better understanding

Objective:

- To know the literary background from eighteenth century to the present age
- To understand the biographies of different writers

Outcome:

- Understand the literary background of British literature from age of Pope to modern age the English society
- Know about author's biography

UNIT I

The age of Pope

The age of Dr. Johnson

UNIT II

The age of Wordsworth

UNIT III

The age of Tennyson

UNIT IV

The age of Hardy

UNIT V

Present age

Text book:

Author	Title of the book	Edition / Year	Publisher
Hudson	History of English Literature	2012	Maple Press

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Aim:

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

Techniques of effective listening
Listening and comprehension
Probing questions
Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

Techniques of effective reading
Gathering ideas and information from a given text
Identify the main claim of the text
Identify the purpose of the text
Identify the context of the text
Identify the concepts mentioned
Evaluating these ideas and information
Identify the arguments employed in the text
Identify the theories employed or assumed in the text
Interpret the text
To understand what a text says
To understand what a text does
To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
- Well-knit logical sequence
- Narrative sequence

Category groupings

Different modes of Writing

- i. E-mails
- ii. Proposal writing for Higher Studies
- iii. Recording the proceedings of meetings
- iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. Powerpoint

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Digital Marketing

Unit VII

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhuchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER – III

தமிழ்நாடு பல்கலைக்கழகம் - வல்வம், தஞ்சாவூர்

பாட குறியாடு :

தமிழ் மூன்றாம் பருவம்

இரண்டாம் ஆண்டு

செய்தல், அட்வைன்ஸ் இலக்கிய வரலாறு

செய்தல்

அககு : 1

1. சிவப்பிரகாசம் - மனவழிப் படுத்தி காலை
2. மணிமேகலை - ஆதினாடு பிச்சையிட்ட காலை
3. சீவக சிந்தாமணி - விமலையார் இவ்வப்பம்

அககு : 2

4. பெரியபுராணம் - இளையாள் குடியாறு நாயனார் புராணம்
5. சம்பவாபவணம் - கைமேயி மூலினைப் படவம்

அககு : 3

6. சீராபுராணம் - நடு அகநாடுப் ப.வம் - 24 வரிசை
7. தேய்வளனி - வாமல் ஆட்சி ப.வம் - முதல் 5 பாடல்கள்

அககு : 4

8. நளவெண்பா - வயர்வர காண்டம் (20 - 51)

அககு : 5 : இலக்கிய வரலாறு

9. அட்வைன்ஸ் , ஐஞ்சிறு அட்வைன்ஸ் , புராணங்கள் , இதுவரலாறுகள்

EMPLOYABILITY

course Code	Course Title	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand phonetics
- Develop writing skill
- Able to develop creative writing

UNIT –I

The organs of speech

Classification of speech sounds

Vowels and Diphthongs

UNIT –II

Consonants

Consonant cluster

UNIT – III

Syllable

Word accent

Intonation

UNIT – IV

Idiom

Interpretation of graphics

UNIT – V

Slogan writing

Writing advertisement

Reference books:

Author	Title of the book	Edition / Year	Publisher
T.B. Balasubramanian	A text book of Phonetics for Indian Students	Reprint 2008	Macmillian
Meenakshi Sharma & Sangeetha Sharma	Technical Communication	2011	Oxford University Press

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – 1

The Doctor's World - R.K. Narayan
 The Postmaster - Rabindranath Tagore
 Princess September - E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay
 The Open Window -Saki
 The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke
 Uneasy Home Coming - Will F. Jenkins
 Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer
 The Case of the Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton
 The Princess and the Wood Cutter -Alan Alexander Milne

Text book:

Author	Title of the book	Edition / Year	Publisher
Steuart H.King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One – Act Play		Emerald

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC33	Literature in Augustan Period	4	0	0	3

Aim:

- To acquaint with the far-reaching changes in literary form, content and style especially in Augustan period

Objective:

- To learn how Elizabethan excess got vitiated in the restricted and restrained form of poetry and satirical prose, poetry and fiction.

Outcome:

- Assess the writers in Augustan period
- Recognise and explain the connections between their own experiences and the world using the texts

UNIT I

An Epistle to Dr.Arbutnot -Alexander Pope

UNIT II

Coverley Papers- Of Club, Sir Roger at the Theatre -Addison & Steele

UNIT III

Moll Flanders -Daniel Defoe

UNIT IV

Gulliver's Travel -Jonathan Swift

UNIT V

Tom Jones -Henry Fielding

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC34	Literature in Romantic Period	4	0	0	3

Aim:

- To acquaint with an explosive reaction against the preceding Augustan Literature

Objective:

- To observe how the pendulum naturally swings away from the regulated and the restrained Augustan Literary products to the unbridled and spontaneous Romantic literary output.
- To appreciate the literary outputs of the Romantic period

Outcome:

- Understand British Literature in Romantic period
- Interpret and explain the connections between their own experiences and the world using the texts

UNIT I

Tintern Abbey -William Wordsworth

Kubla Khan -S.T. Coleridge

UNIT II

Ode to the West Wind -P.B. Shelley

Ode to a Nightingale -John Keats

UNIT III

Christ Hospital

Dream Children -Charles Lamb

UNIT IV

On Reading Old Books

On the fear of Dead -William Hazlitt

UNIT V

Emma -Jane Austen

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111SEC35	Literary Forms and Prosody	5	0	0	4

Aim

- To acquaint with the features of literary genres and prosody.

Objective:

- To learn the matter, manner and style of every literary form in English Literature
- To speak and write effectively by knowing the figures of speech

Outcome:

- Examine the features of literary genres
- Analyse and interpret the text to which genre it belongs

UNIT-1

Poetry- Subjective and Objective poetry
The Ode, The Elegy, The Lyric, The Sonnet, The Epic, The Ballad

UNIT- II

Prose -The Essay, The Short Story, Biography, Autobiography

UNIT- III

Fiction – Epistolary Novel, Historical Novel, Picaresque Novel, Science Fiction, Psychological Novel, Social Novel, Stream of Consciousness Novel

UNIT- IV

Drama –Liturgy, Mystery plays, Miracle plays, Morality plays, Interludes, Farce, Masque Tragedy, Comedy, Historical Play, One-Act Play

UNIT- V

Prosody-Metre, Syllable, Rhyme, Stanza forms
Figures of Speech

Text book:

Author	Title of the book	Edition / Year	Publisher
B.P.Prasad	A Background to the Study of English Literature	2008	Macmillan

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC36	Shakespeare	4	0	0	3

Aim:

- To acquaint with the quintessence of English literature through the study of Shakespeare

Objective:

- To understand the intrinsic merits and the indispensability of the Shakespearean literature

Outcome:

- Understand the genius of Shakespeare
- Explore the plays of Shakespeare

UNIT I

Mid Summer Night's Dream

UNIT II

Antony and Cleopatra

UNIT III

Twelfth Night

UNIT IV

Romeo and Juliet

UNIT V

King Lear

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111RMC37	Research Methodology	2	0	0	2

Aim:

- To create a basic appreciation towards research process and awareness of various research publication

Objectives:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases

Outcome:

- Understand the steps to do research
- Able to carry out independent literature survey
- Assess basic literary research tools.

UNIT I

Research – Definition, Objectives, Motivation and purpose, Distinction between Literary Research vs Social Science Research, Types of literary research, Criteria of Good Research

UNIT II

Problems encountered by researchers

Assignments, term papers, dissertation, thesis

Conventions of writing

Planning the thesis-selecting a topic, reviewing the literature, designing the study, the chapter outline

UNIT III

Data collection-Primary data- works of the author/s, autobiography, Interviews, articles in newspapers, magazine, letters, data collected through surveys, tools for questionnaire, interviews.

Secondary data-Articles in journals, books, critical books on the author, magazines, e-articles, websites.

UNIT IV

Writing the thesis- the general format, the page and chapter format

Mechanics of writing-Spelling, Punctuation, Italics, Names, Numbers, Titles, Capitalization, paragraphs, quotation, work cited, bibliography

Revising the thesis-editing, evaluating, proof reading

UNIT V

Practical exercise to prepare a paper for a journal-poem, short story, novel, drama

Uses of computer in research

Text book:

Author	Title of the book	Edition / Year	Publisher
Joseph Gibaldi	M L A Hand Book	VIII Ed,2009	First East West Press
Anderson et al	Thesis and Assignment writing		
Kothari	Research Methodology Methods & Techniques	II, 2005	New Age International

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER – IV

மெட்ரிக் இயற்கணிதம் பக்கவாக்கமுடைய வணிக, தொழில்நுட்ப

பாட. குறிப்பிட்டு : தருகிடு.

நூல்களும் பருவம் இலண்டாம் சீதலண்டு

பெட்டிபுள் , வங்க இலக்கியம், சீத இலக்கியம் , பெட்டிபுள் , இலக்கிய வரலாறு

சீதல . 1 : பண்டிய இலக்கியம் - நற்றிணை ;

1. பெட்டிபுள் - சீதலி கூற்று - பாடல் எண் . 11
2. சீதலிபுள் - தலையி கூற்று - பாடல் எண் . 64
3. பூண்டல - தலையி கூற்று - பாடல் எண் . 142
4. பாண்டல - நற்றிணை கூற்று - பாடல் எண் . 29
5. மருதம் - தலையி கூற்று - பாடல் எண் . 70

பண்டிய இலக்கியம் குறுந்தொகை

- 1 . சீதலிபுள் - சீதலி கூற்று - பாடல் எண் . 1
2. பூண்டல - பெட்டிபுள் கூற்று - பாடல் எண் . 167
3. மருதம் - தலையி கூற்று - பாடல் எண் . 181
4. பெட்டிபுள் - தலையி கூற்று - பாடல் எண் . 290
5. பாண்டல - தலையி கூற்று - பாடல் எண் . 347

பண்டிய இலக்கியம் ஐங்குறுநூறு

1. மருதம் - வண்டல் மருத - பூண்டல இலண்டு பாடல்வகை
2. பெட்டிபுள் - சீதலிபுள் குறுந்தொகை மருத - பூண்டல இலண்டு பாடல்வகை
3. சீதலிபுள் - குறுந்தொகை மருத - பூண்டல இலண்டு பாடல்வகை
4. பாண்டல - இலண்டலிடு மருத - பூண்டல இலண்டு பாடல்வகை
5. பூண்டல - பாண்டல மருத - பூண்டல இலண்டு பாடல்வகை

சீதல . 2 : கவிந்தொகை

- 1 . பாண்டல - பாடல் எண் . 2
2. சீதலிபுள் - பாடல் எண் . 37

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop writing skill
- Comprehend and describe poems
- Learn interviewing skills

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation –Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

Reference books:

Author	Title of the book	Edition / Year	Publisher
Rajendra Pal & J.S Korlahalli	Essentials of Business Communication	2015	Sultan Chand & Sons
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Wren & Martin	English Grammar & Composition	2009	S.Chand

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Objective:

- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express one's views in writing

UNIT –I

My Last Duchess -Robert Browning

The Toys -Coventry Patmore

I, too -Langston Hughes

UNIT –II

How to be a Doctor -Stephen Leacock

My Visions for India -A.P.J. Abdul Kalam

Woman, not the weaker sex -M.K. Gandhi

UNIT –III

The Best Investment I ever made-A.J.Cronin

The Verger -W.S Maugham

A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth

As You Like It

UNIT –V

Henry IV

Tempest

Text book:

Author	Title of the book	Edition / Year	Publisher
Devaraj	English for Enrichment		Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111SEC43	Language and Linguistics	4	0	0	3

Aim:

- To acquaint with the linguistic aspects

Objective:

- To understand the basic components of English language in terms of phonetics
- To enable the students to know how the different sounds are produced
- To transcribe the words

Outcome:

- Understand Linguistic aspects through Phonetics.
- Improve pronunciation
- Learn about intonation, syllable and stress

UNIT-I

Characteristics of Language

Linguistics- Concepts, Distinction, Types

The Air-Stream Mechanisms

UNIT-II

Organs of Speech

Consonants

Consonant Clusters in English

UNIT-III

Vowels & Diphthongs of English

Phonology

Syllable

UNIT-IV

Word Accent

Intonation

Assimilation and Elision

UNIT-V

Transcription -Words

Text Book:

Author	Title of the book	Edition / Year	Publisher
T.B. Balasubramanian	A text book of Phonetics for Indian Students	1985	Macmillan

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC44	Literature in Victorian Period	4	0	0	3

Aim:

- To acquaint with the Victorian poets, novelists and dramatists

Objective:

- To know the optimism and pessimism as reflected in Victorian poetry, some of the bleak aspects of the society

Outcome:

- Understand British Literature in Victorian period
- Interpret and explain the connections between their own experiences and the world using the texts

UNIT –I

Ulysses -Tennyson.

The Last Ride Together -Robert Browning

UNIT-II

The Scholar Gypsy -Mathew Arnold

The Blessed Damozel -D.G. Rossetti

UNIT-III

Great Expectation -Charles Dickens

UNIT-IV

Mayor of Casterbridge -Hardy

UNIT-V

Pygmalion -G.B Shaw

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC46	Literary Criticism	5	0	0	4

Aim:

- To acquaint with the area of criticism.

Objective:

- To learn the definition of criticism and its kinds
- To know the genesis of literary criticism and its development from the classical to the modern age
- To understand the features of different criticism

Outcome:

- Understand the art of criticism
- Provide the various phases of literary criticism

UNIT-I

Literary Criticism- Definition & Types

Classical Criticism-Plato

UNIT-II

Classical Criticism-Aristotle, Horace, Quintilian, Longinus

UNIT- III

Renaissance Criticism

Neo Classical Criticism

UNIT-IV

The Romantic Criticism

Victorian Criticism

UNIT-V

Modern Criticism

New Criticism

Text book:

Author	Name of the Book	Edition/Year	Publisher
M.S.Nagarajan	English Literary Criticism and Theory	2020	Orient Blackswan

ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
20111AEC47	Indian and European Classics in Translation	4	0	0	3

Aim:

- To understand the art of translation

Objective:

- To familiarize with the classical poetry of antiquity and fictions of modernity.
- To facilitate the learners to approach the text from a cross cultural perspective.
- To appreciate the writings for their literary value, culture, philosophical and socio political background.

Outcome:

- Interpret the text from a cross cultural perspective.
- Appreciate classical poetry and drama

UNIT- I

The Odyssey -Homer

UNIT -II

Faust -Gothe

UNIT- III

Shakuntala -Kalidasa

UNIT- IV

Thirukkural -Thiruvalluvar

UNIT -V

The Ramayana -Rajagopalachari

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

Basic Leadership Skills

- Motivation
- Team work
- Negotiation
- Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent

- Delegation of tasks
- Learn to coordinate
- Conflict management

Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

Design Thinking

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elington, J., & Hartigan, P. (2008). *The Power of*

Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press.

- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us* All. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER – V

Course Code	Course Title	L	T	P	C
20111AEC51	Literature in Modern Period-I	5	0	0	3

Aim:

- To acquaint with the literary works of the modern period

Objective:

- To familiarize poetry, prose, fiction, and poetic drama in modern period
- To understand the social milieu of the modern period

Outcome:

- Understand British Literature in Modern period
- Explain the connections between their own experiences and the world using the texts

UNIT-I

The Three Companions -W.H. Auden

God's Grandeur -Hopkins

UNIT-II

On Smiles, On Saying Please -A.G Gardiner

UNIT-III

Sons and Lovers -D.H Lawrence

UNIT-IV

Murder in the Cathedral -T.S.Eliot

UNIT-V

Importance of Being Ernest -Oscar Wilde

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC52	American Literature	5	0	0	3

Aim:

- To acquaint with the American literature with the help of selected literary works belonging to the genres of poetry, prose and drama.

Objective:

- To understand the culture and aspirations of the American writers

Outcome:

- Acquire knowledge about American text
- Know American dream, culture, myth, race
- Explore the connections between their own experiences and the world using the texts

UNIT I

I taste a liquor never Brewed -Emily Dickinson

Mending wall -Robert Frost

UNIT II

Brahma -Emerson

Annabel Lee -Edgar Allan Poe

UNIT III

The Old man and the sea -Hemingway

UNIT IV

Adventures of Huckleberry Finn -Mark Twain

UNIT V

The Glass Menagerie -Tennessee Williams

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111SEC53	English Language Teaching	5	1	0	5

Aim:

- To acquaint with the inkling about the field of teaching English

Objective:

- To understand the problems of English teaching in India
- To know how to prepare a lesson plan
- To enable the students how to teach poetry, prose and drama
- To learn how to teach composition and pronunciation
- To enhance the students with the testing and evaluation techniques

Outcome:

- Learn to teach English literature
- Know how to teach LSRW
- Able to prepare lesson plan

UNIT-I

Aims and objectives of teaching English
English teaching in India-Problems, Remedies

UNIT-II

Curriculum
Syllabus
Lesson plan

UNIT-III

Teaching of Pronunciation
Teaching of Vocabulary
Teaching of Grammar

UNIT –IV

Reading and Writing skills
Teaching of Composition
Teaching of Prose

UNIT –V

Teaching of Poetry
Testing and Evaluation
Types of Questions, Characteristics

Text books:

Author	Title of the book	Publisher
Dr.P.S.S Sastry	Methods of Teaching English- Book I, II	Madhava Publishers

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111SEC54	Translation	5	1	0	4

Aim:

- To cope better in the multilingual and multicultural milieu

Objective:

- To know the different types of translation
- To encounter the problems in translation.
- To teach the techniques of translation.
- To develop their translation skill

Outcome:

- Learn the art of translation
- Provide the history of translation
- Understand the problems in translation

UNIT-I

Translation- definition, nature, scope

Translator and his qualities

UNIT-II

History of translation

UNIT-III

Types of Translation

UNIT-IV

Problems in Translation

UNIT-V

Techniques of translation-Translate sentences

Text books:

Author	Title of the book	Edition / Year	Publisher
Dr. R Shanthi	Towards Translation	2009	Emerald Publisher

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111DSC55A	Discipline Specific Elective – I -TAGORE	5	0	0	3

Aim:

- To acquaint with selected literary texts of Tagore belonging to the genres of poetry, prose and drama.

Objective

- To familiarize and know in detail Tagore's style and language in his poetry, prose, fiction and drama
- To appreciate Tagore's works

Outcome:

- Understand Tagore's writings in different genres
- Appreciate the artistic and use of language employed by Tagore

UNIT-I

Gitanjali

UNIT-II

The Hungry Stones

Once there was a king

UNIT-III

The Cabuliwallah

The Home Coming

UNIT-IV

The Home and the World

UNIT-V

Chitra

EMPLOYABILITY

SEMESTER – VI

Course Code	Course Title	L	T	P	C
20111AEC61	Literature in Modern Period-II	5	0	0	4

Aim:

- To have a glimpse into the modern literature

Objective :

- To familiarize with the twentieth century literary trends reflected in the form and content of poetry, fiction and drama

Outcome:

- Understand British Literature in Modern period
- Assess the connections between their own experiences and the world using the texts

UNIT-I

Sailing to Byzantium -W.B. Yeats

Gerontion -T.S Eliot.

UNIT-II

The Ideal House, Child's Play-R.L.Stevenson

UNIT-III

Cakes and Ale -Somerset Maugham

UNIT-IV

The Silver Box -Galsworthy

UNIT-V

The Birthday Party -Herald Pinter

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111AEC62	Indian Writing in English	5	0	0	4

Aim:

- To acquaint with the Indian Writing in English

Objective:

- To familiarize with the Indian scenario in English presented by Indian poets, novelists and dramatists
- To learn to appreciate the variety and diversity of Indian Writing in English

Outcome:

- Familiarity with the wide range of literary works in Indian Writing in English
- Explore the cultural and social perspectives
- Analyse and explain the connections between their own experiences and the world using the texts

UNIT I

Palanquin Bearers -Sarojini Naidu

Our Casurina Tree -Toru Dutt

UNIT II

Obituary -A.K. Ramanujam

My Grand Mother's House - Kamala Das

UNIT III

An Astrologer's Day -R.K Narayan

Quilt -Ismat Chughtat

UNIT IV

Nagamandala -Girish Karnard

UNIT V

Untouchable -Mulk Raj Anand

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC63	Commonwealth Literature	5	1	0	5

Aim:

- To learn the British influence in different countries.

Objective:

- To acquaint with the impact of British culture upon African and Australian societies as reflected in their literature
- To serve to sensitize the English literature which emerged in the twentieth century

Outcome:

- Understand Commonwealth literature
- Explain the connections between their own experiences and the world using the texts
- Know about the social and literary background of commonwealth countries

UNIT – I

The Dying Eagle -E.J. Pratt

Fire at Murdering Hut -Judith Wright

UNIT-II

Relationships -Jayant Mahapatra

My Daughter's Boyfriend- Razia Khan

UNIT-III

The Lion and the Jewel -Wole Soyinka

UNIT –IV

The Novelist as a Teacher -Chinua Achebe

UNIT –V

The Stone Angel -Margaret Lawrence

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20111DSC64A	Discipline Specific Elective –I NOVEL	5	0	0	3

Aim:

- To acquaint with the different classifications of the novel

Objective:

- To understand the features and narrative techniques of Historical, Epistolary, Social and Scientific and Stream of Consciousness novels
- To appreciate the different forms of novels

Outcome:

- Appreciate the different forms of novel
- Analyse the novels and find the features of different types of novel

UNIT I

Historical Novel

Kennilworth -Scott

UNIT II

Epistolary Novel

The Sound and the Fury - Faulkner

UNIT III

Stream of Consciousness Novel

Mrs.Dalloway -Virginia Woolf

UNIT IV

Social Novel

A Tale of Two Cities -Charles Dickens.

UNIT V

Scientific Novel

The Time Machine -H.G Wells

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Aim:

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNRGA, etc.

EMPLOYABILITY/ SKILL DEVELOPMENT



PRIST
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THANJAVUR – 613 403 - TAMILNADU

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF ENGLISH
2021 – 2022

MA ENGLISH – 20PGENGGE- COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
SEMESTER I					
20211AEC11	History of English Language and Structure	6	0	0	4
20211AEC12	Shakespeare	6	0	0	4
20211AEC13	British Literature	6	0	0	4
20211AEC14	Indian Writing in English	6	0	0	4
20211DSC15	Discipline Specific Elective – I	5	0	0	4
20211RLC16	Research Led seminar	-	-	-	1
	Total	29	0	0	21
SEMESTER II					
20211AEC21	Women's writing in English	5	0	0	4
20211AEC22	Post-Colonial Literature	6	0	0	4
20211AEC23	Diaspora Literature	6	0	0	4
20211AEC24	Comparative Literature & World Classics in Translation	5	0	0	4
20211DSC25	Discipline Specific Elective – II	5	0	0	4
20211RMC26	Research Methodology	3	0	0	2
20211BRC27	Participation in Bounded Research	-	-	-	2
	Total	30	0	0	24
SEMESTER III					
20211SEC31	Critical Approaches to English Literature	6	0	0	5
20211AEC32	American Literature	6	1	0	5
20211AEC33	Literary Criticism	6	1	0	5
2011DSC34	Discipline Specific Elective – III	5	0	0	4
20_OEC	Open Elective	4	0	0	3
2011SRC36	Design/Socio Technical Research	-	-	-	2
	Total	27	2	0	24
SEMESTER IV					
2011SEC41	Translation	5	1	0	5
2011SEC42	English Language Teaching	6	1	0	5
2011AEC43	English Literature for Competitive Examination	6	0	0	5
2011DSC44	Discipline Specific Elective – IV	5	0	0	4
2011PRW45	Project Work	0	0	0	6

2011PEE	Programme Exit Examination	0	0	0	2
	Total	22	2	0	27
	Total Credits for the Programme				96

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	a)20211DSC15A- Romantic Movement b)20211DSC15B- Literature and Gender c) 20211DSC15C- Indian Literature - I d) 20211DSC15D- Gothic Literature e) 20211DSC15E-18 th Century Drama
II	a)20211DSC25A- Asian Literatures in English b)20211DSC25B- New Literature c) 20211DSC25C- Irish Literature d) 20211DSC25D- Indian Literature - II e) 20211DSC25E-19 th Century Drama
III	a)20211DSC34A- African Literature b)20211DSC34B- French Literature c) 20211DSC34C- Medieval Literature d) 20211DSC34D- Modernism and PostModernism e) 20211DSC34E-20 th Century Drama
IV	a)20211DSC44A- Indian Fiction in Translation b)20211DSC44B- Epics in Translation c) 20211DSC44C- Linguistics Approach to Literature d) 20211DSC44D- Australian Literature e) 20211DSC44E- Asian American Literature

MA ENGLISH - SYLLABUS

SEMESTER I

Course Code	Course Title	L	T	P	C
20211AEC11	History of English Language and Structure	6	0	0	4

Aim:

- To acquaint with the historical evolution and development of English Language and structure.

Objective:

- To understand the origin and development of English language
- To learn the impact of time upon the language in terms of the insular and the international influences leading to growth of vocabulary, change in spelling, change of meaning, usage and the like.
- To know about the great makers of Modern English.

Outcome:

- Learn the impact of time upon the language in terms of the insular and the international influences leading to growth of vocabulary, change in spelling, change of meaning, usage and the like.
- Provide an overview of the different phases of the evolution of English language
- Introduce to the makers of English language

UNIT – I

The origin of language

The descent of the English language, Laws of language

The Old English period

UNIT – II

The Middle English period

The Renaissance and after

Modern period

UNIT – III

The evolution of Standard English

The shaping, building and ordering of words

Spelling and pronunciation

UNIT –IV

Growth of Vocabulary

Change of Meaning

Idiom and metaphor

UNIT - V

Makers of Modern English: The Bible, Spenser, Shakespeare, Milton and Johnson.

Foreign Influences: Greek, Latin, Scandinavian, French and Italian

Text book:

Author	Title of the book	Edition / Year	Publisher
F.T.Wood	An Outline History of English Language	First Edition 2008	Macmillan
C.L.Wren	The English Language	Second Reprint 2003	Vikas Publishing House Pvt. Ltd.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211AEC12	Shakespeare	6	0	0	4

Aim:

- To acquaint with Shakespeare who is not of an age but of all times

Objective:

- To know the genius and the craftsmanship of Shakespeare
- To analyse Shakespeare's heroes
- To explore Shakespeare's heroines
- To examine Shakespeare's villains
- To evaluate Shakespeare's fools

Outcome:

- Understand the craftsmanship of Shakespeare.
- Assess Shakespeare's heroes, heroines, villains and fools

UNIT I

Love's Labour's Lost

Heroes in Shakespeare's plays

UNIT II

Henry IV Part –I

Women in Shakespeare's plays

UNIT III

Winter's Tale

Fools in Shakespeare's plays

UNIT IV

Tempest

Shakespeare's Concept of tragedy

UNIT V

Hamlet

Soliloquies in Shakespeare's plays

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20211AEC13	British Literature	6	0	0	4

Aim:

- To study the different genres of British Literature

Objective:

- To facilitate the study of the epic, Elizabethan prose, drama and fiction
- To analyse the text

Outcome:

- Understand the craftsmanship of Shakespeare.
- Assess Shakespeare's heroes, heroines, villains and fools

UNIT-I

Paradise Lost -John Milton Book IX

Church going -Philip Larkin

UNIT-II

Rape of the Lock -Alexander Pope

The Jaguar -Ted Hughes

UNIT-III

New Atlantis -Bacon

A Passage to India -E.M Forster

UNIT-IV

Pride and Prejudice -Jane Austen

To the Lighthouse -Virginia Woolf

UNIT-V

Doctor Faustus -Marlowe

The Cocktail Party -T.S Eliot

Self-study topics

Lord of the Flies -William Golding

The Winslow Boy -Terrence Rattigan

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20211AEC14	Indian Writing in English	6	0	0	4

Aim:

- To keep abreast with the study of Indian Writing in English as a class in itself.

Objective:

- To have a deeper insight into the genesis of Indian English literature and its output in different forms.
- To know about the style of Indian writers

Outcome:

- Understand the genesis of Indian English literature and its output in different forms.
- Learn the genius of different Indian authors
- Provide an overview of the different phases of the evolution of Indian writing in English

UNIT I

Origin and growth of Indian Literature – Poetry, Prose

UNIT II

Origin and growth of Indian Literature – Novel, Drama

UNIT III

Rumination -Darwallah

Poet, Lover and Bird – Watcher -Ezekiel

A Hot Noon in Malabar -Kamala Das

UNIT IV

My Experiments with Truth -M.K.Gandhi

That Long Silence -Shashi Deshpande

UNIT V

Hayavadhana -Girish Karnad

Silence, The Court is in Session - Vijay Tendulkar

Text Book:

Author	Title of the book	Edition / Year	Publisher
K.R.Srinivasa Iyengar	Indian Writing in English	2019	Sterling Publishers Pvt Ltd

Self-study topics:

From Heaven Lake

-Vikram Seth

The Doldrummers

-Asif Currimbhoy

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
2021DSC15A	Discipline Specific Elective – I Romantic Movement	5	0	0	4

Aim:

- To acquaint with the Romantic Movement in English literature

Objective:

- To understand the features and background of romanticism
- To learn the impact of romanticism upon contemporaneous writings and later writings
- To appreciate the works of writers influenced by the Romantic Movement

Outcome:

- Explore the features and background of Romanticism
- Comprehend the works of writers influenced by the Romantic Movement

UNIT-I

Romanticism- Characteristics, origin and growth of the movement-British Literature

UNIT-II

Romanticism- Characteristics, origin and growth of the movement-American Literature, Indian Writing in English

UNIT-III

Ode to Intimation on Immortality - Wordsworth

La Belle Dame Sans Merci - Keats

To a Skylark -Shelley

UNIT-IV

The Philosophy of Composition - Edgar Allan Poe

A Red, Red Rose -Robert Burns

The Rhodora -Ralph Waldo Emerson

UNIT-V

The Lotus- Toru Dutt

The Snake Charmer - Sarojini Naidu

Transformation - Sri.Aurobindo

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
2021DSC15B	Discipline Specific Elective – I B Literary Movement	5	0	0	4

Aim:

- To acquaint with many literary movements

Objective:

- To analyse the features of the various literary movements
- To learn the background and the writers of all the literary movements

Outcome:

- Understand the background and the writers of all the literary movements
- Explore the features of each literary movement

UNIT-I

Metaphysical Movement

Pre-Raphaelite Movement

UNIT-II

Neo-Classicism

Oxford Movement

UNIT-III

Bloomsbury group

Realism

Naturalism

UNIT-IV

Aesthetic Movement

Symbolists

Magic Realism

UNIT-V

Transcendentalism

Beat Generation

Last Generation

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER II

Course Code	Course Title	L	T	P	C
19211AEC21	Women's Writings in English	5	0	0	4

Aim:

- To keep abreast with feminine writings championing the cause of women.

Objective:

- To know the current social trends in favour of women
- To understand both old and modern literature dealing with the male chauvinism in all its ramifications.
- To learn the perspectives of women writers

Outcome:

- Comprehend the perspectives of women writers
- Give an awareness of class, race and gender and how they influence women's lives.
- Explore women's experiences

UNIT – I

Lady Lazarus - Sylvia Plath
The Queen's Rival - Sarojini Naidu
She - Lakshmi Kannan

UNIT – II

The Tree of Life - Toru Dutt
An Introduction - Kamala Das
Success is counted Sweetest - Emily Dickinson

UNIT – III

Goblin Market - Rossetti
A Child Asleep - Elizabeth Browning.

UNIT – IV

Clear Light of Day - Anita Desai
Nectar in a Sieve - Kamala Markandaya

UNIT – V

The God of Small Things - Arundhati Roy
Ladies Coupe - Anitha Nair

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20211AEC22	Post-Colonial Literature	6	0	0	4

Aim:

- To observe how the backlash of colonialism is brought to bear upon literary works.

Objective:

- To know the background and features of the post colonialism
- To analyse how the deleterious impact of colonialism and imperialism has been delineated in literature

Outcome:

- Understand the background and features of the post-colonialism
- Learn the impact of colonialism
- Familiarise with the issues related to cultural and national identity

UNIT – I

Post Colonialism-origin, growth and its features

UNIT – II

Midnight's Children -Salman Rushdie

The Wretched of the Earth -Frantz Fanon

UNIT – III

The Vendor of Sweets -R.K Narayan

Things Fall Apart -Chinua Achebe

UNIT – IV

July's People -Nadine Gordimer

The Grass is Singing -Doris Lessing

UNIT – V

The English Patient -Michael Ondaatje

Heat and Dust -Ruth Jabwala

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211AEC23	Diaspora Literature	6	0	0	4

Aim:

- To acquaint with the diaspora literature

Objective:

- To trace the origin and growth of diaspora literature
- To offer a broad view of the literary corpus produced by the writers from the diasporic locations.
- To explore the issues specific to the phenomenon of migration that figure in the representation of diasporic experience.

Outcome:

- Learn the origin and growth of diaspora literature
- Explore the issues specific to the phenomenon of migration that figure in the representation of diasporic experience.
- Aware of the conflicts faced by the migrants

UNIT – I

History of Diaspora literature, theories, features

UNIT – II

A House of Mr. Biswas -V.S Naipaul

Shame -Salman Rushdie

UNIT – III

Jasmine -Bharathi Mukerjee

The Mango Coloured Fish -Kaveri Nambesan

UNIT – IV

The Inheritance of Loss -Kiran Desai

The Namesake -Jhumpa Lahiri

UNIT – V

Can Love Happen Twice -Ravinder Singh

Family Life -Akhil Sharma

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211AEC24	Comparative Literature & World Classics in Translation	5	0	0	4

Aim:

- To familiarize with the comparative literature and world classics in translation

Objective:

- To widen the perspective of students in the larger context of world literature
- To learn different schools of thought
- To demonstrate the relationship between language and culture
- To facilitate a comparative study of literary texts based on themes, myths, archetypes and history

Outcome:

- Understand comparative literature and world classics in translation
- Equip to make comparative and contrastive analysis of literary texts.

UNIT – I

Comparative Literature –definition and scope

French and American Schools of thought

Influence and Reception study

UNIT – II

Genre Study

Thematology

Periodisation

UNIT – III

Translation

Literature and society

Literature and Psychology

UNIT – IV

Agamemnon -Aeschylus

The Wild Duck -Ibsen

UNIT – V

Crime and Punishment -Dostoevsky

Book of Job -Bible

Text Book :

Author	Title of the book	Edition / Year	Publisher
Dr. N. Subramanian	Introduction to the study of	First Edition 1997	TEESI
Dr. Padma Srinivasan	Comparative Literature		
Dr. G.R..Balakrishnan	Theory and Practice		

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211DSC25A	Discipline Specific Elective II –A Asian Literature in English	5	0	0	4

Aim:

- To acquaint with Asian Literature in English

Objectives:

- To familiarize learners with Asian writers in English
- To be aware of various Asian cultures through representative texts of Asian Literature in English

Outcome:

- Understand the text in Asian literature
- Appreciate the style of writers of different countries

UNIT – I (Poetry)

Moon Festival -Bei Dao (Chinese)
The Song -Balkrishna Sama (Nepali)
When Autumn Came-Faiz Ahmed Faiz (Pakistani)

UNIT – II(Prose)

Mosquitoes -Lafcadio Hearn (Japanese)
Village Goes Town -J. Vijayatunga (Sri Lankan)

UNIT – III(Short Story)

SMS -Sunethra Rajakarunanayake (Sri Lankan)
A Little Incident -Lu Hsun (Chinese)
His Spouse -Zawgyi (Myanmar)

UNIT – IV(Fiction)

Kartography -Kamila Shamsie (Pakistani)
Please Look After Mom -Kyung-sook Shin (Korean)

UNIT – V(Drama)

The Year of Dragon -Frank Chin (Chinese)
Hogoromo (The Feather Mantle)-Zeami Motokiyo (Japanese)

Reference Books:

Author	Title of the book	Edition / Year	Publisher
Tyler, Royall	Japanese No Dramas	2004	Penguin Books
Azim, Firdous, and Niaz Zaman	Galpa: Short Stories by Women from Bangladesh.	2006	Rachana Writers.Ink
Wijesinha, Rajiva	Bridging Connections: An Anthology of Sri Lankan Short Stories	2007	National Book Trust
Shamsie, Muneeza	And the World Changed: Contemporary Stories by Pakistani Women.	2008	
Ganesan.S	Asian Voices: An Anthology of Asian Writings in English	2015	New Century Book House,

EMPLOYABILITY/ SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211RMC26	Research Methodology	3	0	0	2

Aim:

- To create a training in research process to carry out independent literary research work

Objectives:

- To develop suitable methods of data collection and interpretation
- To use literary resource base for evaluation and support literary hypothesis and validation
- To carry out basic literature survey using the common data-bases

Outcome:

- Ability to develop research hypothesis and carry out independent literature survey corresponding to the specific publication type.
- Assess basic literary research tools.

UNIT I

Research – Definition, Objectives, Elements of Literary research, Ethics & Misconduct in research, Plagiarism

UNIT II

Planning the thesis-selecting a topic, reviewing the literature, designing the study, the chapter outline

Writing the thesis- the general format, the page and chapter format

Mechanics of writing-Spelling, Punctuation, Italics, Names, Numbers, Titles, Capitalisation, paragraphs, quotation, work cited, bibliography

Revising the thesis-editing, evaluating, proof reading

UNIT III

Data collection-Primary data- works of the author/s, autobiography, Interviews, articles in newspapers, magazine, letters, data collected through surveys, tools for questionnaire, interviews. Secondary data-Articles in journals, books, critical books on the author, magazines, e-articles, websites.

UNIT IV

Rhetoric and its devices, jargon, terminology, slang, colloquialism, formal writing, vague, concrete words, denotation, connotation, verbosity, precision, sentence structure

UNIT V

Practical exercise to prepare a paper for a journal-poem, short story, novel, drama

Use of computer in research-literary tools used in research

Text Book:

Name of the Author	Title of the book	Edition / Year	Publisher
Joseph Gibaldi	M LA Hand Book	Seventh Edition 2009	East-West Press
C.R Kothari	Research Methodology- Methods and technique	Second Edition 2005	New age International Publishers

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER III

Course Code	Course Title	L	T	P	C
20211SEC31	Critical Approaches to English Literature	6	0	0	5

Aim:

- To acquaint with various approaches to literature.

Objective:

- To realize that an impassioned scientific approach even to aesthetic delight has its own validity.
- To analyse a text using various approaches

Outcome:

- Assess a text using various approaches to English Literature
- Know about various approaches

UNIT-I

Archetypal Approach

UNIT-II

Moral Approach

UNIT-III

Formalistic Approach

UNIT-IV

Psychological Approach

UNIT-V

Sociological Approach

Term paper:

Analyse a text using various approaches to English Literature

ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
20211AEC32	American Literature	6	1	0	5

Aim:

- To acquaint how American Literature has evolved to be an independent entity.

Objective:

- To know the genesis and growth of literature such as ‘American’, involving the confluence of varied and variegated cultures
- To learn a historical background to American history and literature
- To analyse the major themes and concerns reflected in American literature

Outcome:

- Understand the major themes and concerns reflected in American literature
- Provide an overview of the different phases of the evolution of American literature

UNIT I

Origin and growth of American Literature- Poetry, Prose

UNIT II

Origin and growth of American Literature- Novel, Drama

UNIT III

Daddy -Sylvia Plath
 After Apple Picking -Robert Frost
 To Helen -Edger Allen Poe

UNIT IV

The American Scholar -Emerson
 Walden-The Battle of Ants -Thoreau
 Farewell to Arms -Hemingway

UNIT V

The Hairy Ape -O’ Neil
 All My sons -Arthur Miller

Self study topics:

The Age of Innocence -Edith Wharton
 Who’s Afraid of Virginia Woolf? -Edward Albee

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20211AEC33	Literary Criticism	6	1	0	5

Aim:

- To recapitulate the origin and development of criticism from the period of Aristotle to modern age.

Objective:

- To introduce that criticism is a creative work bringing about far reaching impact.
- To analyse a text using various criticism
- To understand the theories formulated by various writers

Outcome:

- Assess a text using various criticism
- Get in touch with different views of critics

UNIT – I

Poetics. -Aristotle

An Apology for Poetry. -Sir Philip Sidney

UNIT – II

Preface to the Fables -Dryden

Essay on Criticism -Alexander Pope

UNIT – III

Preface to Shakespeare -Samuel Johnson

The Preface to Lyrical Ballads -William Wordsworth

UNIT – IV

Biographia Literaria -S.T.Coleridge

A Defence of Poetry -Shelley

UNIT – V

The Study of Poetry -Matthew Arnold

Tradition and Individual Talent -T.S.Eliot

ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
20211DSC34A	Discipline Specific Elective - III A African Literature	5	0	0	4

Aim:

- To acquaint the students with the African literature

Objective:

- To give a glimpse into the British colonialism and its aftermath.
- To trace the origin and growth of African literature.
- To know how an indomitable urge for seeking separate identity finds expression in the different genres of literature.
- To understand African literature, their landscape, tradition, milieu, spirit, socio cultural ethos, national identity etc.

Outcome:

- Learn the origin and growth of African literature.
- Enable to understand African literature, their landscape, tradition, milieu, spirit, socio cultural ethos, national identity etc.

UNIT – I

Origin and growth of African Literature-Poetry, Prose and Drama

UNIT – II

Poets in Africa -Roy Campbell

The Casualties -J.P.Clark

A Far Cry from Africa -Derek Walcott

UNIT – III

The Arrow of God -Chinua Achebe

Cry the Beloved Country -Alan Patson

UNIT – IV

Waiting for the Barbarians -J.M Coetzee

A Grain of Wheat -Ngugi waThiongo

UNIT – V

The Road -Wole Soyinka

Devil on the Cross -Ngugi waThiongo

EMPLOYABILITY/ SKILL DEVELOPMENT

SEMESTER IV

Course Code	Course Title	L	T	P	C
20211SEC41	Translation	5	1	0	5

Aim:

- To initiate the students into the mechanics of translations

Objective:

- To know the origin and development of translation.
- To promote translation
- To understand the theories of translation
- To encounter the problems in translation.
- To develop their translation skill

Outcome:

- Enhance the translation skill
- Analyse the theories of translation
- Learn modern and cultural translation

UNIT – I

History of translation

UNIT – II

Theories of translation

Theory of meaning

UNIT – III

Literary Translation

Non-Literary Translation

UNIT – IV

Translatability

Difficulties in Translation

UNIT – V

Modern Translation

Cultural translation

Text Book:

Author	Title of the book	Edition/Year	Publisher
P.K. Kalyani	Translation Studies	2001	Creative Books
Dr. Shanthi	Towards Translation	2002	Emerald Publishers

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211SEC42	English Language Teaching	6	1	0	5

Aim:

- To have a good stead for the career of English teacher

Objective:

- To analyse language theories
- To learn different approaches and methods
- To explore the audio-visual techniques
- To orient in the practical application of ELT
- To understand the principles of foreign language teaching

Outcome:

- Enhance to have a good stead for the career of English teacher
- Study the approaches, methods and techniques in teaching English
- Know how to use audio visual aids

UNIT- I

The place of mother tongue in teaching English

English as a second language

UNIT-II

Principles of foreign language teaching

Theories of Language Learning

UNIT-III

Approaches of Teaching English

Methods of Teaching English

UNIT-IV

Techniques for language teaching

Audio – Visual Teaching

UNIT-V

Micro Teaching

Macro Teaching

Case study

Text Book:

Author	Title of the book	Publisher
Dr. P.S.S Sastry	Methods of Teaching English Book I & Book II	Madhava Publishers

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20211AEC43	English Literature for Competitive Examination	6	0	0	5

Aim:

- To attempt a relation of what is learnt to take up a competitive exam.

Objective:

- To resuscitate what has been learnt in every branch of English Language and Literature and compete with others for a career.
- To impart in students the confidence and skills to face the challenge of a competitive exam

Outcome:

- Take up a competitive exam.
- Learn the different areas in English literature

UNIT-I

British Literature

UNIT-II

American Literature

UNIT-III

Indian Writing in English

UNIT-IV

Literary Forms

UNIT-V

English Language Teaching

Text Book:

Author	Title of the book	Publisher
William Henry Hudson	An Outline History of English literature	Maple Press
Dr. P.S.S Sastry	Methods of Teaching English - Book I & Book II	Madhava Publishers

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20211DSC44A	Discipline Specific Elective - IV A Indian Fiction in Translation	6	0	0	4

Aim:

- To acquaint with the translated fiction in Indian Writing in English

Objective:

- To analyse the techniques of translation
- To know the culture and society of various parts of India
- To understand the fiction in other languages in India

Outcome:

- Comprehend the fiction in other languages in India
- Identify the culture expressed in other languages

UNIT-I

Rudali -Mahasweta Devi

Karukku -Bama, translated by Lakshmi Holmstorm-Oxford

UNIT-II

Godaan -Prem Chand,

A Home in the Sky -Vaasanthi translated by Gomathi Narayanan

UNIT-III

Samskara -U. R Anandamurthy, translated by AK Ramanujan-OUP

Once an Actress -Jayakanthan, translated by K. S Subramanian

UNIT-IV

Tamas -Bhisham Sahni

Bridges -Sivasankari translated by S. Krishnan

UNIT-V

Chemmeen -Thakazli Sivasankar Pillai translated by T. Pillai & Anita Nair

Krishna Krishna -Indira Parthasarathy

EMPLOYABILITY/ SKILL DEVELOPMENT



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DEPARTMENT OF ENGLISH
M.Phil ENGLISH LITERATURE-2020 SYLLABUS
2021 – 2022
M.Phil ENGLISH LITERATURE -20MPENGGE
SYLLABUS – REGULATION 2020

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
Semester I					
203ENC11	Research Methodology and Theory of Literature	2	2	0	2
203ENC12	Literary Theory	2	2	0	2
203ENC13_	Discipline Specific Elective	2	2	0	2
Common Paper	Research and Publication Ethics	2	2	0	2
	Total	8	8	0	8
Semester II					
203END21	Dissertation				2
	Total				
Total					2

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	203ENC13A-Modern Criticism
	203ENC13B-Cultural Studies

Course Code	Course Title	L	T	P	C
203ENC11	RESEARCH METHODOLOGY AND THEORY OF LITERATURE-	2	2	0	2

Aim:

To acquaint with the research methodology

Objective:

To know the convention and format of thesis

To understand the methods and mechanics of research writing

To familiarize with the kinds of the discourse

To gain knowledge to use computer in research

To analyse data

To learn the intrinsic and the extrinsic approach

Outcome:

Can do research activity

Interpret any text using various criticisms and theories

Know and use the kinds of discourses

Analyse data

UNIT-I

Research, Types of Research

Planning the thesis

Writing the thesis- General format, Chapter format

UNIT-II

Mechanics of writing

Documentation-Quotation, Works cited, Bibliography

UNIT-III

Discourse: Narration,Argumentation,Exposition,Description

UNIT-IV

Computer uses in research

Modern technology applied in research

Statistical techniques and data analysis

UNIT-V

The Extrinsic approach to the study of literature-Literature and biography, literature and psychology, literature and society

The Intrinsic approach to the study of literature-The mode of existence of a literary work of art, The nature and modes of narrative fiction.

Reference Books-

Theory of Literature - Wellek and Warren

Thesis and Assignment Writing -Anderson et al

MLA Handbook for writers of research papers -Eighth edition

Research Methodology Methods and Techniques - C.R Kothari

Microsoft Office2003 -Edward C Willett

1stedition 2004 (Wiley Publications, USA)

Fundamentals of Information Technology - Alexis Ieon, Mathews Ieon 1999. (Vikas Publications)

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
203ENC12	LITERARY THEORY	2	2	0	2

Aim:

To acquaint with the concepts and features of different literary theories

Objective:

To sharpen the critical ability by learning the literary theories

To appreciate, interpret and critically evaluate any text

Outcome:

Understand literary theory

Evaluate any text using various theories

Sharpen critical analysis

UNIT – I

Modernism: Meaning, origin, present condition

Structuralism: Meaning, origin, Saussure, Levi Strauss, Genette, reactions

UNIT – II

Post-Structuralism: Meaning, origin, types, Derrida, Deconstruction, reactions

New Historicism: Meaning, origin, Foucault, Old historicist, New historicist, Stephen Grennblat, reactions

UNIT – III

Reader Response Theory: Meaning, influences, limitations

Psychoanalytical Criticism: Meaning, origin, influences, limitations

UNIT – IV

Feminism: Definition, Feminist movement, studies of women writers, influence

Marxism: Definition, Marx and Engelstheories, Marxist literary critics

UNIT – V

Post-colonialism: Meaning, influences, principles, postcolonial critics

Eco-Criticism: Meaning, tradition, Ecocritics

Reference Books:

Classical to Contemporary theory: A Demystified Approach- Dr. Joseph Chandra &

K.S Anthony Samy

Beginning Theory- Peter Harry

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
203ENC13A	MODERN CRITICISM	2	2	0	2

Aim:

To acquaint with the modern criticism

Objective:

To understand the different concepts of modern criticism

Outcome:

Comprehend modern criticism

Evaluate any text using various criticisms

UNIT – I

“The Language of Paradox”. - Cleanth Brooks

“Criticism as Language”. - Ronald Barthes

“Realism and the Contemporary Novel” - Raymond Williams

UNIT – II

“Structuralism and Literature” -Jonathan Culler

“Towards Feminist Poetics” -Elaine Showalter

“The Seven Types of Ambiguity” -William Empson

UNIT – III

“Religion and Literature” -T.S.Eliot

“Four Kinds of Meaning” -I.A.Richards

“Creative Writers and Day Dreaming” -Sigmund Freud

UNIT – IV

“Is there a text in the class?” -Stanley Fish

“Orientalism” - Edward Said

“Cultural Studies and its Theoretical Legacies”- Stuart Hall

UNIT – V

“What is an Author?” -Michael Foucault

“Post-colonial Criticism” - Homi Bhabha

“Can the Subaltern Speak” - Gayatri Spivak

Reference Book:

Twentieth Century Literary Criticism -Bijay Kumar Dass.

Literary Criticism -V.S.Sethuraman

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
203ENC13B	CULTURAL STUDIES	2	2	0	2

Aim:

To acquaint with the different cultures

Objective:

To understand the different cultures of various literature

Outcome:

Scholars can cross through many cultural works and their customs

Evaluate any text using various cultures

UNIT – I

Introduction to Cultural Studies and popular culture

Cultural Studies: Its Development and Trends

UNIT – II

Folklore and Culture

Society and Culture

UNIT – III

Culture and Heritage

Gender and Culture

UNIT – IV

“A Man of the People”- Chinua Achebe

“Voss”– Patrick White

UNIT – V

“Romola” – George Eliot

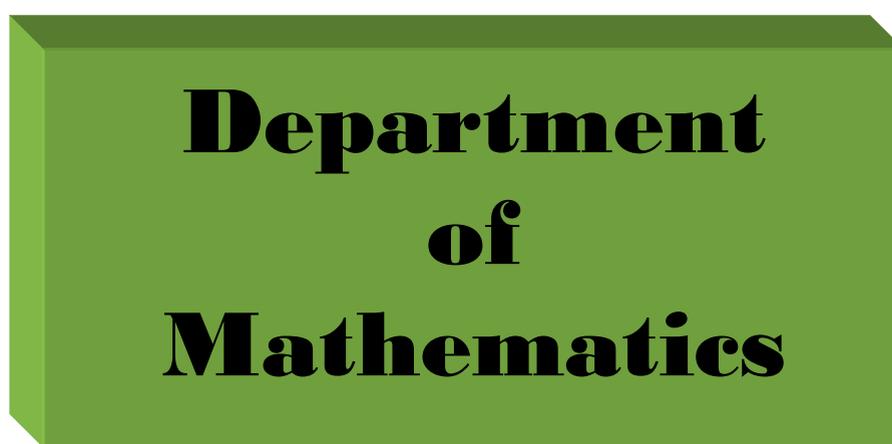
“The Village”- Mulkraj Anand

EMPLOYABILITY



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THANJAVUR – 613 403 - TAMILNADU

B.SC., MATHEMATICS
(2020-REGULATION)



1.1.3	Colour
	Employability
	Skill Development



SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF MATHEMATICS
B.Sc., MATHEMATICS - REGULATION 2020

COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami – I/Advanced English-I/Hindi-I/ French - I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20112AEC13	Differential Calculus and Vector Calculus	5	0	0	3
20112AEC14	Trigonometry, Analytical Geometry 3D and Calculus	5	0	0	3
20120AEC15	Programming in C	6	0	0	5
PRACTICAL					
20120AEC16L	Programming in C Lab	0	0	3	2
Total		24	0	3	17
AUDIT COURSE					
201ACLSICN	Indian Constitution	-	-	-	2
201ACLSUHV	Universal Human Values	-	-	-	2

SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil – II/ Advanced English-II/Hindi-II/ French – II	4	0	0	2
20111AEC22	English-II	4	0	0	2
20112AEC23	Integrals & Differential Equations	5	0	0	3
20112SEC24	Sequence and series	5	0	0	4
20120AEC25	Web Programming	5	1	0	5
PRACTICAL					
20120AEC26L	Web Programming Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20112RLC27	Research Led Seminar	-	-	-	1
	Total	23	1	3	18
AUDIT COURSES					
201ACLSCOS	Communication Skills	1	1	1	2
201ACSSBBE	Basic Behavioral Etiquette	-	-	-	2

SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil – III/Hindi-III/Advanced English-III/ French – III	4	0	0	2
20111AEC32	English-III	4	0	0	2
20112AEC33	Number Theory	4	0	0	3
20112AEC34	Numerical Analysis	4	0	0	3
20118AEC35	Mathematical Statistics-I	5	1	0	5
PRACTICAL					
20118AEC36L	Mathematical Statistics-I Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20112RMC37	Research Methodology	2	0	0	2
	Total	23	1	3	19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Tamil-IV/Advanced English-IV /Hindi-IV/ French – IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20112SEC43	Operations Research	4	0	0	3
20112AEC44	Astronomy	4	0	0	3
201ENSTU45	Environmental Studies	2	0	0	2
20118AEC46	Mathematical Statistics-II	5	1	0	5
PRACTICAL					
20118AEC47L	Mathematical Statistics- II Lab	0	0	3	2
	Total	23	1	3	19
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability				2

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
20112AEC51	Modern Algebra	5	0	0	4
20112AEC52	Real Analysis	5	1	0	4
20112SEC53	Statics	5	1	0	4
20112SEC54	Programming in C++	5	0	0	3
20112DSC55	Discipline Specific Elective -I	5	0	0	3
RESEARCH SKILL BASED COURSE					
20112BRC56	Participation in Bounded Research	1	1	1	1
	Total	25	2	0	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	1	1	1	2

SEMESTER – VI

Course Code	Course Title	L	T	P	C
THEORY					
20112AEC61	Complex Analysis	5	0	0	4
20112SEC62	Dynamics	5	1	0	4
20112AEC63	Discrete Mathematics	5	0	0	4
20112DSC64_	Discipline Specific Elective –II	5	0	0	4
201_ _OEC(2 Digit Course Name)	Open Elective	4	0	0	2
PRACTICAL					
20120SEC65L	Project Work	-	-	-	4
20120SEC66L	Program Exit Examination	-	-	-	1
	Total	24	1	0	23
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	1	1	1	2
201ACLSCET	Community Engagement	1	1	1	1
Total Credits -Programme					115
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 20112DSC55A – Fuzzy Analysis b) 20112DSC55B - Formal Languages and Automata Theory
	Discipline Specific Elective Courses-I
VI	a) 20112DSC64A - Graph Theory b) 20112DSC64B - Mathematical Modelling

Open Electives

Semester	Open Elective Courses
VI	a) 201TNOEC-Tamil IlakkiyaVaralaru b) 201ENOEC-Journalism c) 201PHOEC-Instrumentation d) 201CEOEC-Food and Adulteration e) 201BTOEC- Wildlife Conservation f) 201CSOEC – E-Learning

g) 201CAOEC-Web Technology
h) 201CMOEC-Banking service

Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	17	-	-	-	-	-	17
II	13	4	-	-	1	-	18
III	17	-	-	-	2	-	19
IV	14	3	-	-	-	2	19
V	8	7	3	-	1	-	19
VI	8	4	4	2	4	1	23
Total	77	18	7	2	8	3	115

SEMESTER I

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil -I	4	0	0	2

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil -I	4	0	0	2

தமிழ். திரைப்படப் பங்களிப்புகள்- வன்மை, தஞ்சாவூர்
பாட. குறியாடு : தமிழ் முதல் பருவம்
முதலாம் ஆண்டு
இக்கல் இலக்கியம் - வெட்டியல், சிறுகதை , நாடகம், இலக்கிய வரலாறு
ஆககு : 1. வெட்டியல்
 உய்யுள்ளவை கவாமிசன் - ஆதார புலனம் - சிவம்பர றுசியம் - 40 ஆகுகள்
 இராமலிங்க ஆகுகள் - திருவருப்பா - அருணை விண்ணியம் - 40 ஆகுகள்
 அகிலாணி தேசிக விநாயகம் பிள்ளை - மலரும் மாணவரும் - 52 ஆகுகள்
 பாரதியார் - புதுமைப்பிள்ளை - 40 ஆகுகள்
 பாரதிதாசன் - பாரதிதாசன் அகிலாசன் , தமிழ் இனிமை , தமிழ் அணவு
ஆககு : 2. வெட்டியல்
 நாமச்சல் அகிலம் - தமிழ் தேள் - தமிழ் வளர்க்க கூறும் செட்டிலைம் , 40 ஆகுகள்
 ந. பிச்சுபுத்திரி - வழிநடாணை - அகிலாச குருடன் , 42 ஆகுகள்
 கரகா - தேவமறைய, அன்பு , 22 ஆகுகள்
 அண்ணாநாசன் - இலக்கியம் , ஒரு பாணையில் கதை , 54 ஆகுகள்
 அப்துல் ரஹ்மான் - செந்திரசூதிகள் , குப்பையவை கிளையும் சிறுகதைகள், 80 ஆகுகள்
ஆககு : 3. சிறுகதை
 க.சமுத்திரம் - தேலில் புத்திர பகா
ஆககு : 4. நாடகம்
 கு. வெ. பாண்டிமணியன் , செந்திர புத்திர (அரரரரர நாடகம்)
ஆககு : 5. இலக்கிய வரலாறு
 சிறுகதை , புதினம், நாடகம் அரரரரர , அகிலாச , புத்திரககிலாச

Course Code	Course Title	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To enhance vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Learn to edit and do proof reading
- Read and comprehend literature

UNIT – I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Comparison and contrast

Cause and effect

UNIT – IV

Editing

Proof reading

UNIT – V

Speeches of famous people:

Mahatma Gandhi- Abraham Lincoln- Swami Vivekananda- John F. Kennedy

Reference book:

Author	Title of the book	Edition / Year	Publisher
Wren and Martin	English Grammar	2009	S.Chand & Company Ltd
Meenakshi Raman & Sangeetha Sharma	Technical Communication	Second Edition 2011	Oxford University Press
Sudhir Kumar Sharma	The World's Great Speeches	-	Galaxy Publishers

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature
- Appreciate the different types of poetry and prose

UNIT –I

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT – II

Enterprise -Nissim Ezekiel

Love poem for a wife -A.KRamanujam

UNIT –III

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -ArunaGnanadason

UNIT –IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –V

Oliver Twist -Charles Dickens

Text book:

Author	Title of the book	Edition / Year	Publisher
S.Murugesan/Dr.K.Chellappan	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

Course code	Course Title	L	T	P	C
20112AEC13	Differential Calculus and Vector Calculus	5	0	0	3

Objectives:

This course is designed to give students a secure base in elementary calculus and vector calculus to allow them to tackle the mathematics needed in other sciences. Students wishing to do more mathematics will be given a good foundation from which they can proceed to other courses.

UNIT I:

Successive differentiation — Leibnitz theorem with proof — Problems, Partial derivative of a function.

UNIT II:

Maxima & Minima for functions of two variables — Lagrange multiplier method.

UNIT III:

Curvature (Cartesian, Polar and Pedal form) — evolutes.

UNIT – IV

Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative -Unit normal vector- tangent plane, Divergence- Curl –

Solenoidal&Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.

Unit –V

Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential- Work done by d Force- Surface integrals – Volume integrals.

Text Books:

- 1.Differential calculus — T.K.M. Pillai
- 2.Vector calculus — T.K.M. Pillai.

Reference:

T.K. Manickavasagam Pillai, Analytical Geometry (3D) & Vector calculus, Neq Gamma Publishing House, 1991

Learning outcomes

By the end of this course, you should:

- ✓ be able to manipulate, and solve problems using, successive differentiation & vector operators;
- ✓ be able to calculate Maxima & Minima for functions of two variables and Lagrange multiplier method
- ✓ be able to solve curvature, evolutes, asymptotes and envelopes in simple cases.
- ✓ be able to calculate gradient, divergence and curl vectors.

Course code	Course Title	L	T	P	C
20112AEC14	Trigonometry, Analytical Geometry 3 D and	5	0	0	3

Objectives:

This course is designed here to get sufficient ideas about integral calculus, trigonometry and analytical geometry to tackle the mathematics needed in other sciences.

UNIT I:

Expansions of $\cos n\theta$, $\sin n\theta$, $\cos^n\theta$, $\sin^n\theta$ (for positive integral values of n) — series for $\cos\theta$, $\sin\theta$, $\tan\theta$.

UNIT II:

Hyperbolic functions — Principal and general values of logarithms of complex numbers. Separation of real and imaginary parts — factorization.

UNIT III:

Summation of trigonometrical series — method of difference - sum of series of n angles in A.P., C+ is form, Gregory's series.

UNIT IV:

Analytical Geometry (3-D)
Spheres (Simple Properties only) general second degree equations to cone cylinder.

UNIT V:

Integral calculus.
Evaluation of double and Triple integral — Beta and gamma integrals.

Text Books:

1. Trigonometry — T.K.M. Pillai
2. Analytical Geometry (3D) And Integral Calculus — T.K.M. Pillai

Learning outcomes

By the end of this course, you should:

- ✓ be able to manipulate the expansions of basic trigonometric functions
- ✓ be able to calculate summation of trigonometric series and Gregory's series
- ✓ understand the concept of analytical geometry and be able to use properties of spheres, cone and cylinder in real cases.
- ✓ be able to manipulate, and solve problems using, integral calculus

Allied- I- Paper -I PROGRAMMING IN C

Course code	Course Title	L	T	P	C
20120AEC15	Allied- I- Paper -I Programming In C	6	0	0	5

Objectives:

- To learn the concept of programming
- To understand input and output functions
- To study about Structures
- To learn Pointers in C Language

UNIT I :

Evolution and Applications of C - Structure of a C Program -Data Types -

Declaration - Operators - Expressions - Type conversions -Built-in functions.

UNIT II :

Data Input and Output - Control statements: IF, ELSE-IF, GOTO, SWITCH, WHILE- DO, DO-WHILE, FOR, BREAK and CONTINUE.

UNIT III :

Functions:

Defining and accessing functions-passing parameters of functions -Arguments - Recursive functions -Storage classes.

Arrays:

Defining and processing Arrays -Multi dimensional arrays - passing arrays to functions -Arrays and strings String functions - String Manipulations.

UNIT IV :

Pointers

Pointers Declarations - Operations on pointers -pointers to functions - Pointer and Strings - pointers and arrays - array of pointers - Structures and pointers -unions.

UNIT V :

Data files -Opening, Closing, and processing files - Files with structures and unions

Register variables - Bit wise Operations - Macros- Pre-processing

Reference:

1. "Programming with C" — ByronS.Gottfried — Schauni's outline series — Tata McGrawHill publications.
2. "Let us C "— Yeswantkanetkar — BPB Publications.

Learning Outcomes:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications

Allied- I Practical -I PROGRAMMING IN C LAB

Course code	Course Title	L	T	P	C
20120AEC16L	Allied -I -Paper -I Programming in C Lab	0	0	3	2

Objectives

Programming in C Lab provides the methodology for the planning and execution for any scientific enquiry, which has been accepted as a valid tool in this content. In this course Quadratic Equation, Sum of Series (Sine, Cosine, e^x), Fibonacci Numbers using recursive functions, Sorting of given names in alphabetical order, Matrix Operations (Addition, Subtraction, Multiplication — use functions) would be taught.

Students are able to the C program

1. Write a C program to find the roots of Quadratic Equation (all cases).
2. Write a C program to find the Sum of Series (Sine, Cosine, e^x)
3. Write a C program to reads an integer N and determine whether N is prime or not.
4. Write a C program to Finding factorials, generating Fibnoacci Numbers using recursive functions.
5. Write a C program to find the numbers in Ascending and Descending order (use it to find largest and smallest numbers).
6. Write a C program to find the sum of natural numbers using WHILE statement.
7. Write a C program for Sorting of given names in alphabetical order.
8. Write a C program for Matrix Operations (Addition, Subtraction, Multiplication — use functions).
9. Write a C program for String Manipulation without using String functions (String length, String Comparison, String Copy, Palindrome checking, counting words and lines in strings — use function pointers).

Learning Outcomes:

At the end of the course, the student should be able to:

- Students learned program techniques
- Understand the concept of various functions and pointers
- A knowledge of writing C program
- Design/development of solutions

INDIAN CONSTITUTION

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

Objectives:

1. To make the students understand about the democratic rule and parliamentary administration
2. To appreciate the salient features of the Indian constitution
3. To know the fundamental rights and constitutional remedies
4. To make familiar with powers and positions of the union executive, union parliament and the Supreme Court

To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court - functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications,
India
- 2) Aiyer, alladikrishnaswami, Constitution and fundamental rights 1955.
- 3) Markandan. K.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, ourparliament, National book trust, New Delhi 1989

UNIVERSAL HUMAN VALUES

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Course Objectives :

The present course deals with meaning, purpose, and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualization.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the way of the world.

Unit I :Love & Compassion

- Introduction: What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they

don't practice love and compassion?

- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II: Truth

- Introduction: What is truth? Universal truth, truth as value, truth as fact(veracity, Sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit III :Non-Violence

- Introduction: What is non violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organizations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing on-violence: What will learners learn/gain if they practice non- violence? What will learners lose if they don't practice it?

- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV: Righteousness

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V: Peace

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organizations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit VI: Service

- Introduction: What is service? Forms of service, for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit VII: Renunciation(Sacrifice)

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restrain and
Ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Course Code	Course Title	L	T	P	C
20110AEC12	Tamil -II	4	0	0	2

தமிழ் இலக்கியப் பங்களிப்புகள்- கவிதை, தஞ்சாவூர்
 வல. குழியாடு : தமிழ் இலக்கியப் பருவம்
 முதலாம் பிழைப்பு
 செட்டியன் , பத்தி இலக்கியம், சிறுநிலக்கியம் , இலக்கிய வரலாறு

பிழைப்பு : 1 . செட்டியன் :

1. திருமுறைப்பந்தர் தேவாரம் - சேனாநாயகியம்
2. திருமுறைப்பந்தர் தேவாரம் - தனிச் சிறுநிலக்கியம்
3. சந்திரர் தேவாரம் - திருமுறைப்பந்தர் தனி மறை
4. மாணிக்கவாசகர் - திருமுறைப்பந்தம் - திருமுறைப்பந்தம்

பிழைப்பு : 2 . செட்டியன் :

5. சுவாமிநாதர் - பெருமான் திருமுறை
6. நாயக்கர் திருமுறை பெருமான் - இலக்கியப் பந்தம் - கவிதை கவிதை
7. பிழைப்புகள் - நாயக்கர் திருமுறை - திருமுறைப்பந்தம் கவிதை
8. திருமுறைப்பந்தம் - சிறுநிலக்கியம்

பிழைப்பு : 3 . செட்டியன் :

- 9 . திருமுறை - பிழைப்பு திருமுறை
- 10 . சுவாமிநாதர் - மாணிக்கவாசகர் மீளமை - தமிழ் கருமை பருவம்
- 11 . திருமுறைப்பந்தம் - சிறுநிலக்கியம் - சிறுநிலக்கியம் கவிதை
- 12 . கவிதை - திருமுறைப்பந்தம் கவிதை

பிழைப்பு : 4 . பிழைப்பு

- 13 . சுவாமி. மாணிக்கவாசகர் - கவிதை

பிழைப்பு : 5 . இலக்கிய வரலாறு

- 14 . கவிதை கவிதை இலக்கியங்கள் , சிறுநிலக்கியங்கள் , (பந்தம் - மீளமைத்தமிழ் - பந்தம்)

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop technological skill
- Able to write in a variety of formats
- Read biographies and develop personality

UNIT – I

E-mail

Fax

Memos

UNIT – II

Itinerary

Checklist

UNIT – III

Invitation

Circular

UNIT – IV

Instruction

Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

Text Book

Author	Title of the book	Edition / Year	Publisher
Meenakshi Raman &Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Rajendra Pal &J.S.Korlahalli	Business Communication	2015	Sultan

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Acquire language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology -A.K. Ramanujan

Gift -Alice Walker

The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans

Asleep -Ernst Jandl

Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas

I Have a Dream -Martin Luther king

Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe

The Fortune Teller -Karel Capek

Proposal -Anton Chekov

Text book:

Author	Title of the book	Edition / Year	Publisher
GowriSivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

Course code	Course Title	L	T	P	C
20112AEC23	Core -III Basic Mathematics III (Integrals and Differential Equations)	5	0	0	3

INTEGRALS AND DIFFERENTIAL EQUATIONS

UNIT I:

Properties of definite integrals and solve standard problems. Reduction formulae- $\int x^n e^{ax} dx$, $\int x^n \cos ax dx$, $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \cos^m x \sin^n x dx$ and problems based on above types working problems based on $\int \sin^m x \cos^n x dx$

UNIT II:

Second order differential equation with constant coefficients - $e^{\alpha x} g(x)$, $x \sin x$, $x \cos x$, $x^2 \cos x$ types only and with Variable coefficients- Variation of parameters

UNIT III:

Partial differential equations. Formation of equation — General, particular and complete integrals of PDE — Lagrange's method four standard forms

UNIT IV:

Laplace Transforms: Laplace transform and its application for solving ordinary differential equations — convolution theorem for Laplace transform — problems.

UNIT V:

Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions- change of interval — Half range series.

Reference

Calculus -T.K.M.Pillai, Arumugam and S.Narayanan.
Differential equations -S.Narayanan

SEQUENCE AND SERIES

Course code	Course Title	L	T	P	C
20112SEC24	Core -III Basic Mathematics III (Integrals and Differential Equations)	5	0	0	4

UNIT 1:

Sequence, Limits, Convergence-Cauchy's general principle of convergence- Cauchy's first theorem on Limits-Bounded sequences-Monotonic sequence always tends to a limit, finite or infinite - Limit superior and limit inferior.

UNIT 2:

Infinite series-Definition of convergence, Divergence and Oscillation-Necessary Condition for Convergence - Convergence of $\sum 1/n^p$ and Geometric series. Comparison test, D 1 Alembert's ratio test and Raabe's test –Simple problems.

UNIT 3:

Cauchy's condensation test, Cauchy's root test and their simple problems Alternative series with simple problems.

UNIT 4:

General summation of series including successive difference and recurring series.

UNIT 5:

Inequalities - Geometric and Arithmetic means Weistrass inequalities- Cauchy's inequality.

TEXT BOOK:

Alebra Volume I & Volume II T.K.M.Pillai (Relavant problems only)

Unit I : Chapter 2 (4,7)

Unit II : Chapter 2 (8-14,16,18,19)

Unit III : Chapter 2 (15,17,21-24)

Unit IV : Chapter 5

Unit V : Chapter 4 (second volume)

General Reference

Sequence and series: Arumugam and Isaac

Course code	Course Title	L	T	P	C
20120AEC25	Allied -I-Paper-II Web Programming	5	1	0	5

Objectives

- give you a general understanding of how a computer works
- introduce you to assembly-level programming
- prepare you for future courses. .

UNIT-I:

Introduction to HTML- Head and body sections- Hyper text and Link in HTML

documents.

UNIT-II:

Designing the body section- Managing images in HTML.

UNIT-III:

Ordered and Unordered Lists –Table Handling.

UNIT-IV:

DHTML and Style Sheet – Frames.

UNIT-V:

A Webpage design project – Forms.

REFERENCE BOOKS:

1. World Wide Web Design with HTML – c.Xavier –Tata McGraw-Hill-2000.
2. Principles of web design –Joel Sklar –Vikas Publishing House 2001.

Learning outcomes

By the end of this course, you should be able to:

- describe the fetch-execute cycle of a computer
- understand the different types of information which may be stored within a computer memory
- write a simple assembly language program

Allied- I Practical—II WEB PROGRAMMING LAB

Course code	Course Title	L	T	P	C
20120AEC26L	Allied-I Practical-II Web Programming Lab	0	0	3	2

Objectives

1. To create a fully functional website with mvc architecture
2. To develop an online book store
3. To provide an understanding of the language translation peculiarities by designing a complete translator for a mini language

1. Create a Web page for ABC INFOTECH LTD., with necessary images and marquee.

2. Create Web pages which displays the menu card of a hotel. The first page should contain the list of items available. After selection of one item, the corresponding details should be displayed on the next page.

3. Create a Web page which displays the balance sheets for the given list of companies (same as above problem).

4. Create a Web page for XYZ INFOTECH LTD., to display the company profile employee details balance sheet, receive resume, customer service using links.

5. Using frames create web pages for a travel agency

6. Create a Web page using forms for our college students admission process. (Use list box, push button, radio button, command button, rich text box, text box, etc where ever applicable)

7. Create a Web page which receives suggestions from customers for a software development & consultancy agency using necessary.

Learning outcomes

By the end of this course, you should be able to:

- Will create a fully functional website(online book store) using mvc architecture
- Will create a complete translator for a mini language
- Understand the basic terminology used in computer programming
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.

Course code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Course Objectives:

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I :Listening

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II: Speaking

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III: Reading

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text
 - ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV: Writing and different modes of writing

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing -
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V: Digital Literacy

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. PowerPoint

Unit VI: Effective use of Social Media

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Digital Marketing

Unit VII: Non-verbal communication

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference Books

- SenMadhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
- Silvia P.J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

Course Code	Course Title	L	T	P	C
20110AEC13	Tamil -III	4	0	0	2

தமிழ் நவீனப் பல்மொழிப்பாடல் - வல்லம், தஞ்சாவூர்

பாட. குறியாடு :

தமிழ் மூன்றாம் பருவம்

இரண்டாம் ஆண்டு

செய்யுள், நாடகங்கள் இலக்கிய வரலாறு

செய்யுள்

அககு : 1

1. சிவப்பிரகாசம் - மனவாழைப் படுத்தி காணாது
2. மணிமொகை - அழகிய நிகழ்ச்சிகள் காணாது
3. சுவை சந்திரமணி - மொகைகள் இவ்வகை

அககு :2

4. பெரியபுராணம் - இவ்வகை அழகிய நவீனப் புராணம்
5. சிவபுராணம் - கைகவி மூன்றாம் பருவம்

அககு :3

6. சிவபுராணம் - ந.பி அகநாடகம் ப.வம் - 24 வரிகள்
7. தேய்வழி - வாய் அழகிய ப.வம் - முதல் 5 பாடல்கள்

அககு :4

8. நவமொகை - வாய் வரலாறு (20 - 51)

அககு . 5 : இலக்கிய வரலாறு

9. நாடகங்கள் , தஞ்சாவூர் நாடகங்கள் , புராணங்கள் , இதிகாசங்கள்

Course Code	Course Title	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand phonetics
- Develop writing skill
- Able to develop creative writing

UNIT – I

The organs of speech
 Classification of speech sounds
 Vowels and Diphthongs

UNIT – II

Consonants
 Consonant cluster

UNIT – III

Syllable
 Word accent
 Intonation

UNIT – IV

Idiom
 Interpretation of graphics

UNIT – V

Slogan writing
 Writing advertisement

Reference books:

Author	Title of the book	Edition / Year	Publisher
T.B. Balasubramaniyan	A text book of Phonetics for Indian Students	Reprint 2008	Macmillian
Meenakshi Sharma &Sangeetha Sharma	Technical Communication	2011	Oxford University Press

	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – I

The Doctor's World - R.K. Narayan

The Postmaster - Rabindranath Tagore

Princess September - E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay

The Open Window -Saki

The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke

Uneasy Home Coming - Will F. Jenkins

Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer

The Case of the Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton

The Princess and the Wood Cutter -Alan Alexander Milne

Text book:

Author	Title of the book	Edition / Year	Publisher
SteuartH.King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One – Act Play		Emerald

Course code	Course Title	L	T	P	C
20112AEC33	Core – V Number Theory	4	0	0	3

Core V - NUMBER THEORY

Objectives:

The objective is for the students to obtain a foundational knowledge of elements of Number Theory through step-by-step proofs of classical theorems, as well as to sharpen their skills through problem-solving.

UNIT 1:

THE FUNDAMENTAL THEOREM OF ARITHMETIC:- Introduction - Divisibility — Greatest Common divisor — Prime numbers — The fundamental theorem of arithmetic — The series of reciprocals of the primes — The Euclidean algorithm — The greatest Common divisor of more than two numbers.

UNIT 2:

ARITHMETICAL FUNCTIONS AND DIRICHLET MULTIPLICATION:- The motions function $\mu(n)$ — The Euler totient function — A relation connecting ϕ and μ - A product formula for $\mu(n)$ — The Dirichlet product of arithmetical functions — Dirichlet inverses and the Mobius inversion formula — the Mangoldt function $\Lambda(n)$ — Multiplicative functions — Multiplicative function and Dirichlet multiplication.

UNIT 3:

AVERAGES OF ARITHMETICAL FUNCTIONS:- The big oh notation Asymptotic equality of functions — Euler's summation formula — some elementary asymptotic formulas- the average order of $d(n)$ — the average order of the divisor fraction $\delta\alpha(n)$ - the average order of $\phi(n)$.

UNIT 4:

SOME ELEMENTARY THEOREMS ON THE DISTRIBUTION OF PRIME NUMBERS:- Chebyshev's function $\psi(x)$ and $\theta(x)$ - Relations connection $\theta(x)$ and $\pi(x)$ - some equivalent forms of the prime number theorem — Inequalities of $\pi(n)$ and P_n — Shapiro's Tauberian theorem — Application of Shapiro's theorem — An asymptotic formula for the partial sums $\sum p_n \leq (1/p)$ - the partial sums of the mobius function.

UNIT 5:

CONGRUENCES:- Definition and basic properties of congruence's — Residue classes complete residue systems — Linear congruence's — Reduced revised systems — Ruler Fernet's Theorem — Polynomial congruence's module Lagranges theorem — Applications of Lagrange's Theorem — Chinese Remainder theorem.

Reference:

Introduction to Analytic Number Theory by Tom. M.Apostal

For Unit 1 - Chapter 1

For Unit 1 - Chapter 2

For Unit 1 - Chapter 3

For Unit 1 - Chapter 4 Section 4,1 to 4.9 only

For Unit 1 - Chapter 5

General Reference:

1. Number theory : George E.Andrews
2. Introduction to theory of Number : G.H.I-lardy and E.M.Wright.
3. Basic Number Theory :S.B.Malilk.
4. Elements of Number Theory :S.Kumaravelu and SusheelaKumaravelu.

Learning Outcomes:

On satisfying the requirements of this course, students will have the knowledge and skills to:

- ✓ Solve problems in elementary number theory
- ✓ Apply elementary number theory to cryptography
- ✓ Develop a deeper conceptual understanding of the theoretical basis of number theory and cryptography
- ✓ Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization,

Core VI - NUMERICAL ANALYSIS

Course code	Course Title	L	T	P	C
20112AEC34	Core – VI Numerical Analysis	4	0	0	3

Objectives:

The roll of numerical analysis is to develop and analyze the numerical techniques. In this paper, different methods for finding the roots of algebraic and transcendental equations, solutions of simultaneous equations, solutions of ordinary differential equations Solution of Linear systems, Numerical differentiation and integration interpolation with equal & unequal intervals are concentrated.

UNIT 1:

Solutions of Algebraic and transcendental equation iterative method, Bisection method-Aitken's process Method of False Position-Newton-Raphson methods.

UNIT II:

Finite differences-Forward differences backward differences Central differences symbolic relations-Newton's formula for interpolation. Interpolation with unevenly spaced points Lagrange's interpolation formula-divided differences and their properties Newton's General interpolation formula.

UNIT III: Numerical differentiation and integration

Numerical differentiation — integration — Trapezoidal rule and Simpson's rule.

UNIT IV: Solution of Linear systems Gaussian Elimination method — Iterative methods Jacobi and Gauss seidal Methods.

UNIT V:

Numerical solution of Ordinary -Differential Equations. Solution by Taylor's series - Picard's method of successive approximations -Euler method

Modifies Euler's method -RungeKutta methods -Predictor Corrector methods -

Adams method and Mines method.

Text Book

Numerical Methods in Science and Engineering by M.K.Venkatraman

Reference:

Introductory methods of Numerical Analysis By S.S. Sastry- Prentice Hall of India Pvt. Ltd.

Chapters:2. 2.1 to 2.5

3.3.1,3.3,3.6,3.9, 3.9.1,3.10,3.10.1

4. 4.2, 4.4, 4.4.1, 4.4.2

5. 5,4

6. 6.1 to 6.5 and 6.6.1 and 6.6.2

Learning Outcomes:

- Solving problems in algebraic and transcended equations
- Understand about finite differences
- Students develop and analyze numerical tech

- Applying Various numerical methods to solve the ordinary differential equations
- Students gets the Research inquiry and analytical thinking abilities

Course code	Course Title	L	T	P	C
20118AEC35	Mathematical Statistics I	5	1	0	5

Objectives:

Statistics provides the methodology for the planning and execution for any scientific enquiry, which has been accepted as a valid tool in this content. In this course Basic Statistics, Probability, Baye's Theorem, random variables, discrete distributions, continuous functions, Bivariate Distributions, Correlation and Regression would be taught.

UNIT I:

Statistical data — Primary and Secondary data. Formation of frequency distribution Various measures of Central tendency and their merits and demerits various measures of dispersion and their merits and demerits Concept of Skewness and Kurtosis.

UNIT II:

Axiomatic Probability and classical, probability addition, multiplication and Baye's theorems, Simple problems.

UNIT III:

Concept of random variable—discrete and continuous distribution function, probability mass function, probability density function — their properties — mathematical expectation — moment generating function — Simple problems.

UNIT IV :

Bivariate distribution - discrete and continuous, marginal and conditional distribution Statistical independence, Conditional expectation.

UNIT V:

Correlation — Rank Correlation, Karl Pearson's Correlation coefficient and its properties Linear Regression and its properties — Concept of multiple and partial correlation for three variables only.

Text Book:

1. Fundamentals of Mathematical Statistics — S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons, New Delhi.

Reference:

1. Fundamentals of Applied Statistics — S.C.Gupta and V.K.Kapoor. Sultan Chand & Sons.
2. Elementry Statistical Methods – S.P.Gupta, Sultan Chand & Sons, New Delhi.

Learning outcomes

By the end of this course, you should:

- Students gets the methodology for the planning and execution for any scientific enquiry
- Students learning statistical techniques and statistical data
- Understand the concept of random variables
- Understand the concept of Bivariate Distribution..
- A knowledge of constructions and uses correlation and regression.

Course code	Course Title	L	T	P	C
20118AEC36L	Mathematical Statistics – I lab	0	0	3	2

Objectives:

Statistics provides the methodology for the planning and execution for any scientific enquiry, which has been accepted as a valid tool in this content. In this course random variables, discrete distributions, continuous distributions would be taught.

List of Practical's

1. Measures of Central tendencies and measures of dispersion.
2. Moments.
3. Skewness and Kurtosis.
4. Fitting of binomial distribution.
5. Fitting of Poisson distribution.
6. Fitting of Normal distribution.
7. Correlation for Discrete Variables.
8. Correlation for Continuous Variables.
9. Rank Correlation.
10. Regression for Discrete Variables.
11. Regression for Continuous Variables.
12. Index Numbers.

Learning outcomes

By the end of this course, you should:

- Students learned statistical techniques and statistical data.
- Understand the concept of various distributions.
- Understand the concept of Correlation and Regression.
- Study of Index Numbers.

RESEARCH METHODOLOGY

Course code	Course Title	L	T	P	C
20112RMC37	Research Methodology	2	0	0	2

UNIT I

Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Concept of Research Design – Criteria of Good Research, Problems Encountered by Researchers in India. General guidelines for Good housekeeping & Lab-safety- Hygiene (Eye, foot, skin and hand protection) – Safety rules -Equipment protection – Respiratory protective equipment – safety equipment – Leaking, compressed gas cylinders – electrical safety. Fire – extinguishers.

UNIT II

Research Problem: Definition & need of research problem, Types & selection of proper research question and suitable research design with Examples, Literature types- compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III

Methods of data collection – Primary and secondary data – observation – interview – Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises.

UNIT IV

Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis – descriptive statistics – elements of processing through computer-packages for analysis (Excel).

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Technical Presentation

REFERENCE:

1. C.R. Kothari, Research Methodology-Methods & Techniques, 2nd Edition, New Age Int. (P) Ltd, 2004.
2. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
3. S.P.Gupta, “Statistical Methods”, 7th Edition, S. Chand and Co. Ltd., 2004.
4. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
5. Ajai.S.Gaur, SanjayaS.Gaur, Statistical Methods for Practice and Research, Response, 2009

OFFICE AUTOMATION

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Course Objective:

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

Unit I

Knowing the basics of Computers

Unit II

Word Processing (MS word)

Unit III

Spread Sheet (MS XL)

Unit IV

Presentation (MS Power Point)

Unit V

Communicating with Internet

Reference Books:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach, Herb Tyson, Faithe Wempen, Cary N. Prague, Michael R. Groh, Peter G. Aitken, and Lisa A. Bucki - Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil -IV	4	0	0	2

தமிழ் இலக்கியப் பங்களிப்புகள்- கவிதை, தந்திரம்

பல. குடியாடு :தமிழ்.

தமிழ்நாடு இலக்கியப் பங்களிப்புகள்

கவிதை , கவிதை இலக்கியம், தந்திர இலக்கியம் , கவிதை , இலக்கிய வரலாறு

பகுதி . 1 : பங்களிப்புகள் இலக்கியம் - தந்திரம்;

1. கவிதை - கவிதை இலக்கியம் - பல. எண் . 11
2. தந்திரம் - கவிதை இலக்கியம் - பல. எண் . 64
3. பங்களிப்புகள் - கவிதை இலக்கியம் - பல. எண் .142
4. பங்களிப்புகள் - தந்திரம் இலக்கியம் - பல. எண் . 29
5. கவிதை - கவிதை இலக்கியம் - பல. எண் . 70

பங்களிப்புகள் இலக்கியம் குறிப்புகள்

1. தந்திரம் - கவிதை இலக்கியம் - பல. எண் .1
2. பங்களிப்புகள் - கவிதை இலக்கியம் - பல. எண் .167
3. கவிதை - கவிதை இலக்கியம் - பல. எண் . 181
4. கவிதை - கவிதை இலக்கியம் - பல. எண் . 290
5. பங்களிப்புகள் - கவிதை இலக்கியம் - பல. எண் . 347

பங்களிப்புகள் இலக்கியம் குறிப்புகள்

1. கவிதை - கவிதை இலக்கியம் - பல. எண் .1
2. கவிதை - கவிதை இலக்கியம் - பல. எண் .167
3. கவிதை - கவிதை இலக்கியம் - பல. எண் . 181
4. கவிதை - கவிதை இலக்கியம் - பல. எண் . 290
5. பங்களிப்புகள் - கவிதை இலக்கியம் - பல. எண் . 347

பகுதி . 2 : கவிதை இலக்கியம்

1. பங்களிப்புகள் - பல. எண் . 2
2. தந்திரம் - பல. எண் . 37

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop writing skill
- Comprehend and describe poems
- Learn interviewing skills

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation –Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

Reference books:

Author	Title of the book	Edition / Year	Publisher
Rajendra Pal & J.S Korlahalli	Essentials of Business Communication	2015	Sultan Chand & Sons
Meenakshi Raman &Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Wren & Martin	English Grammar & Composition	2009	S.Chand

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Objective:

- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express one's views in writing

UNIT –I

My Last Duchess -Robert Browning

The Toys -Coventry Patmore

I, too -Langston Hughes

UNIT –II

How to be a Doctor -Stephen Leacock

My Visions for India -A.P.J. Abdul Kalam

Woman, not the weaker sex -M.K. Gandhi

UNIT –III

The Best Investment I ever made-A.J.Cronin

The Verger -W.S Maugham

A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth

As You Like It

UNIT –V

Henry IV

Tempest

Text book:

Author	Title of the book	Edition / Year	Publisher
Devaraj	English for Enrichment	2012	Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

Core VIII- OPERATIONS RESEARCH

Course code	Course Title	L	T	P	C
20112SEC43	Core –VIII Operations Research	4	0	0	3

Objectives:

Optimization is an important tool of modern applied mathematics. This course gives an idea to the student to recognize potential linear programming problems, to formulate such problems as linear programming models, to employ the proper computational techniques to solve these problems, and to understand the mathematical aspects that tie together these elements of linear programming. The objective of this paper is to highlight the theoretical, computational and applied aspects of linear programming problems.

UNIT 1:

Introduction to operations Research — Elementary treatment of linear programming simplex Method $<, =, >$, $=$ constraints.

UNIT 2:

Application to Transportation problem - Transportation Algorithm - Degeneracy in Transportation problem, unbalanced transportation problem, Assignment problem - The assignment algorithm - unbalanced assignment problem.

UNIT 3:

PERT and CPM network — critical and sub critical jobs — Determining the critical path.

Network calculation PERT networks probability aspect of PERT — PERT time — PERT cost (omitting Crashing)

UNIT 4:

Sequencing problem: Processing of n jobs through 2 machines - processing n jobs through 3 machines - processing 2 jobs through m machine

Games Theory: Characteristics of games — Maximin, Minmax, criteria of optimality — Dominance property - Algebraic and graphical method of solution of solving 2×2 games.

UNIT 5:

Inventory Theory--Variables in an Inventory problem Techniques of Inventory Control with known demand.

1. Purchasing model with no shortage. 2.. Purchasing model with shortages.
3. Manufacturing model with no shortages, 4. Manufacturing model with shortage.

5. Technique of Inventory Control with uncertain demand. 6. Buffer stock of safety stock model

[In all the units Application of the concept only. No book work]

Reference :

1. Operations Research by Kantiswarup, P.K. Gupta and Manmohan.
2. Resource Management Techniques (Operations Research) V.Sundaresan, K.S. Ganapathy Subramanian, K. Ganesan.
3. Operations Research Methods and Applications, P.Mariappan

Learning outcomes

By the end of this course,

- Students using OR techniques in business tools for decision making
- Students develop PERT and CPM networks and finding the shortest path
- Understand the concept of sequencing problems and game theory
- Students gets the knowledge about inventory theory

Core IX- ASTRONOMY

Course code	Course Title		L	T	P	C
20112AEC44	Core – IX Astronomy		4	0	0	3

Objectives

Knowledge and understanding about celestial objects . Apply scientific reasoning to future astronomical discoveries to understand their validity as well as to everyday situations..Discuss the astronomical refraction zones of Earth, phases of Moon, seasonal Variations, Kepler’s law of motion, anomalies, eclipses.

UNIT-I:

Relevant properties of a sphere & relevant formulae for spherical trigonometry (all without proof) -Celestial sphere -Diurnal motion

UNIT-II:

Earth- Dip of the horizon-Twilight- Astronomical refraction- Tangent& Cosines Formula- Properties & simple problems applying them

UNIT-III:

Keplar’s laws of planetary motion (statement only) -Newton’s deductions from them -Three anomalies of the Earth and relation between them .

UNIT-IV:

Time: Equation of time – Seasons - Years and calendar – Conversion of time - Geocentric parallax - Heliocentric parallax- Aberration of light -simple problems in the above

UNIT-V:

Moon(except Moon’s liberations)-Motions of planet(assume that orbits are circular- Eclipses

Reference

(1) S. Kumaravelu and Prof. SusheelaKumaravelu, Astronomy, SKV Publications,2004

UNIT-I — Chapter1&2

UNIT-II — Chapter 3 Section 1,2,5,6 & Chapter 4

UNIT-III — Chapter 6

UNIT-IV — Chapter 7, Chapter 8 Section 190 - 193 & Chapter 9

UNIT—V—Chapter12,13&14

Reference(s)

[1] J V.Thiruvengkatacharya, A Text Book of Astronomy, S. Chand and Co., Pvt Ltd., 1972

Learning outcomes

By the end of this course, you should:

- **Understand about celestial objects**
- Knowledge about Eclipses
- Different zones of Earth
- Astronomical refraction
- Different phases of Moon

Course code	Course Title	L	T	P	C
20118AEC46	Mathematical Statistics II	5	1	0	5

Objectives:

Statistics provides the methodology for the planning and execution for any scientific enquiry, which has been accepted as a valid tool in this content. In this course Central Limit Theorem, Discrete and Continuous Distributions, Small and Large Sampling would be taught.

UNIT I:

Tchebychev's inequality and weak law of large numbers — Simple form of central limit theorem for i.i.d random variables.

UNIT II:

Binomial, Poisson, Negative binomial, geometric distribution — Constants, moment generating function, Cumulant generating function.

UNIT III:

Continuous distribution — rectangular, exponential, beta, gamma distributions, Normal Distributions.

UNIT IV:

Test of Hypothesis—Null and alternative hypothesis(Concept only) One tail and two tail tests, tests of significance based on normal and t distribution for mean, simple correlation and properties.

UNIT V:

Test of significance based on chi square and F distributions for variance, test for goodness of fit and independence of attributes Analysis of variance — One way and two — way classifications with simple problems.

Text Book:

1. Fundamentals of Mathematical Statistics — S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons, New Delhi.

Reference:

1. Fundamentals of Applied Statistics — S.C.Gupta and V.K.Kapoor. Sultan Chand & Sons.
2. Elementry Statistical Methods – S.P.Gupta, Sultan Chand & Sons, New Delhi.

Learning outcomes

By the end of this course, you should:

- Understand the concept of Tchebychev's inequality and Applications of Central Limit Theorem.
- Understand the concept of Bivariate Distribution.
- A knowledge of test of significance based on parametric and non – parametric test.
- Understood the concept of sampling theory.
- Learned the concept of chi square, F-Test and ANOVA.

Course code	Course Title	L	T	P	C
20118AEC47L	Mathematical Statistics – II lab	0	0	3	2

Objectives:

Statistics provides the methodology for the planning and execution for any scientific enquiry, which has been accepted as a valid tool in this content. In this course, chi-square distribution, sampling distributions and analysis of variance would be taught.

List of Practical's

1. Goodness of fit. (Chi-square Test).
2. Attributes, Contingency table.
3. Large sample tests. Type I.
4. Large sample tests. Type II.
5. Large sample tests. Type III.
6. Large sample tests. Type IV.
7. t — tests.
8. Variance tests. (F-Test)
9. ANOVA.
10. Design of Experiments.

Learning outcomes

By the end of this course, you should:

- A knowledge of test of significance based on parametric and non – parametric test.
- Knowledge of Small and Large Sampling Tests.
- Design/development of solutions.

ENVIRONMENTAL STUDIES

(for under graduate students)

Course code	Course Title	L	T	P	C
201ENSTU45	Environmental Studies	2	0	0	2

Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

2. Nature of Environmental Studies

Definition, scope and importance.
 Multidisciplinary nature of environmental studies
 Need for public awareness.

3. Natural Resources and Associated Problems.

- a) Forest resources: Use and over -exploitation, deforestation, dams and their effects on forests and tribal people.
- b) Water resources: Use and over -utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
- d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer -pesticide problems.
- e) Energy resources: Growing energy needs, renewable and non -renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
- f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification,

Role of an individuals in conservation of natural resources.

4. Ecosystems

Concept of an ecosystem.
 Structure and function of an ecosystem.
 Producers, consumers and decomposers.
 Energy flow in the ecosystem.
 Ecological succession.
 Food chains, food webs and ecological pyramids.
 Introduction, types, characteristics features, structure and function of the following ecosystem:
 a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,
 d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction -Definition: genetic, species and ecosystem diversity.

Bio -geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

India as a mega -diversity nation.

Western Ghat as a biodiversity region.

Hot— spot of biodiversity.

Threats to biodiversity habitat loss, poaching of wildlife, man -wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In -situ and Ex -situ conservation of biodiversity.

5. Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of a individual in prevention of pollution.

6. Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides.

Urban problems related to energy Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issue and possible solutions.

Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.

Environmental Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural / Industrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems — ponds, river, hill slopes, etc.

References:

- 1) Agarwal, K.C., 2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)
- 3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- 4) Clank R.S., Marine Pollution, Clarendon Press Oxford (TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) De A.K., Environmental Chemistry, Wiley Western Ltd.
- 7) Down to Earth, Centre for Science and Environment, New Delhi. (R)
- 8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
- 10) Heywood, V.K. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, V.J. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
- 12) Mickinney, M.L. and School. R.M. 1996, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
- 13) Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).

- 14) Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574zp.
 - 15) Rao M.N. and Dana, A.K. 1987, Waste Water Treatment, Wxford & IBH Publ. Co. Pvt. Ltd., 345p
 - 16) Sharma B.K., 2001, Environmental Chemistry, GokelPubl. Hkouse, Meerut
 - 17) Survey of the Environment, The Hindu (M)
 - 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
 - 19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)
 - 20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
 - 21) Wagner K.D., 1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
 - 22) Paryavaranshastra— Gholap T.N,
 - 23) Paryavaransahastra— Gharapure
- (M) Magazine
 (R) Reference
 (TB) Textbook

Learning Outcomes:

Students who graduate with a major in environmental science will be able to:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
4. Apply their ecological knowledge to illustrate and graph a problem and
5. describe the realities that managers face when dealing with complex issues; and
6. Understand how politics and management have ecological consequences.

Course code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Course Objectives :

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

Unit I-Leadership Skills

Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Teamwork
- Negotiation
- Networking

Unit II--Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organize teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

Unit III--Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

Unit IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation

- Ideation
- Experimentation
- Evolution.

- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

Unit V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision-making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Reference Books:

- Ashokan, M. S. (2015). *Karmayogi: A B biography of E. Sreedharan*. Penguin,UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., &Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- GolemanD. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin BooksIndia
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential WithinUs*
All. WilliamCollins
- KurienV.,& Salve G. (2012). *I Too Had a Dream*. Roli Books PrivateLimited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American ManagementAssociation
- McCormackM.H.(1986). *WhatTheyDon'tTeachYouatHarvardBusinessSchool:NotesFromA Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*.Harpercollins
- SinekS. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*.Penguin
- Sternberg R. J., Sternberg R. J., &BaltesP. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge UniversityPress.

Course code	Course Title	L	T	P	C
20112AEC51	Core-X- Modern Algebra	5	0	0	4

SEMESTER – V

Core X. MODERN ALGEBRA

Objectives:

Algebraic structures like Groups, Rings, Vector spaces are studied. The existence of subgroups of given order and the number of such subgroups are studied. The properties of Euclidean rings are discussed. Vector spaces and its properties which will be useful in the study of Field Theory are exposed. Finally, Lattices and their types and finite Boolean algebras are introduced.

UNIT 1:

Permutation Groups - Sub Groups — Cosets and Lagrange's theorem

UNIT II:

Normal subgroups - Quotient groups. -Homeomorphisms -Isomorphism

UNIT III:

RING THEORY:

Definition and Examples of Rings — Some special Classes of Rings — Homomorphisms - Ideals and Quotient Rings — More ideals and Quotient Rings — Euclidean Rings.

UNIT IV:

VECTORS SPACE:

Elementary Basic concepts — Linear independence and Bases and spaces - Inner product spaces

UNIT V:

VECTOR SPACE:

Rank and Nullity-Matrix of a linear transformation

INNER PRODUCT SPACES:

Introduction-Definitions and examples-Orthogonality-Orthogonal Complement

Text Books:

“TOPIC IN ALGEBRA” by Arumugam . S and Isaac. A.T (Second edition)

For UNIT 1 - .Chapter 3: Section 3.4 to 3.8

For UNIT 2 - Chapter 3: Section 3.9 to 3.11

For UNIT 3 - Chapter 4: Section 4.1 to 4.14

For UNIT 4 - Chapter 5: Section 5.0 to 5.6

For UNIT 5 - Chapter 5: Section 5.7 to 5.8 , Chapter 6 section 6.0 to 6.3

General References

1. Modern Algebra: A.R. Vasistha
2. Modern Algebra : Dr. S. Arumugam.

Learning outcomes

By the end of this course, you should:

- Knowledge and understand about Algebraic structures like Groups, Rings, Vector spaces
- Understood about Morphisms
- Skillness in Linear dep. , in- dep. and bases problems

Core XI - REAL ANALYSIS

Course code	Course Title	L	T	P	C
20112AEC52	Core –XI- Real Analysis	5	1	0	4

Objectives:

This paper is intended to cover all elementary topics in Real analysis such as sequence of real numbers, series of real numbers, continuous functions, connectedness, completeness and compactness. This paper is essential for studying Riemann integrals, fundamental theorem of calculus and improper integrals. This enhances the mathematical maturity of the students.

UNIT I: BASIC TOPOLOGY:-

Finite, countable and uncountable sets - Metric spaces - Compact spaces - Perfect sets - Connected sets.

UNIT II: NUMERICAL SEQUENCES AND SERIES:-

Convergent sequences - Subsequence's - Cauchy Sequences - Upper and Lower limits - some special sequences - Series - Series of Non negative Terms - The Number E - The Root and Ratio Tests - Power series - Summation by parts - Absolute convergence - Addition and Multiplication of series.

UNIT III: CONTINUITY:-

Limits of functions - continuous functions - Continuity and compactness - Continuity and connectedness - Discontinuity - Monotonic functions - Infinite limits and limits at infinity.

UNIT IV: DIFFERENTIATION:-

The derivative of a Real function - Mean value theorems - The continuity of Derivatives - L'Hospital's Rule - Derivatives of Higher order - Taylor's theorem.

UNIT V:

THE RIEMANN- INTEGRALS:- Definition and Existence of the Integral — Properties of the Integral — Integration and Differentiation.

Reference:

Principles of Mathematical Analysis by Walter Rudin, MC Graw Hill.

For UNIT I - Chapter-2

For UNIT II - Chapter-3 (section 3.1 to 3.50)

For UNIT III - Chapter-4

For UNIT IV - Chapter-5

For UNIT V - Chapter-6

General References:

1. Real Analysis : Bartle and Schuhest.
2. Real Analysis : Albert smith E.H.

Learning outcomes

By the end of this course, you should

- Knowledge about Connectedness, completeness and compactness
- Understanding the Riemann integrals, fundamental theorem of calculus
- Analyses the problem and finding the solution

Core XII - STATICS

Course code	Course Title	L	T	P	C
20112SEC53	Core – XII – Statics	5	1	0	4

Course Objectives:

Develop an understanding of the principles of statics, and the ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams.

UNIT-1

Forces and equilibrium –Forces-Resultant of two forces-Three forces related to a triangle –Equilibrium of a particle under three or more forces.

UNIT-II

Forces on a rigid body –Moment –Equivalent systems of forces-Parallel forces varignon's theorem – Forces along a triangle-Couples –Equilibrium of a rigid body under three coplanar forces –Reduction of coplanar forces into a force and a couple.

UNIT –III

Friction –Laws of friction-Coefficient of friction, angle and cone of Friction-Limiting equilibrium of a particle on a rough inclined plane, Tilting of a body Simple problems.

UNIT-IV

Virtual work-principle of virtual work-applied to a body or a system of bodies in equilibrium-Equation of virtual work-Simple problems.

UNIT-V

String –Equilibrium of string under gravity –common catenary-suspension bridge.

Reference:

(1)P.DURAI PANDIAN, Mechanics(vector treatment),S.chand&co.june 1997

UNIT-I chapter 2& chap 3 section 3.1

UNIT-II chapter 4 sec 4.1,4.3 to 4.9 & chap 5 sec 5.1

UNIT –III chap 2 sec 2.1,chap 3 sec 3.2,chap 5 sec 5.2

UNIT-IV chapter 8 ,UNIT-V chapter 9

Reference:

(1) M.K.Venkataraman, Statics, Agasthirpublication ,2002

(2)A.V.Dharmapadham, Statics, S.Viswanathan publishers Pvt Ltd.,1979

(3)S.L.Lony ,Elements of Statics and Dynamics, part-1,A.I.T.Publishers,1991

Course Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. An understanding of the analysis of couples and friction.

Core-XIII- PROGRAMMING in C++

Course code	Course Title	L	T	P	C
20112SEC54	Core-XIII- Programming in C++	5	0	0	3

Objectives

- Utilize Object Oriented techniques to design C++ programs.
- Use the standard C++ library.
- Exploit advanced C++ techniques

UNIT 1: Principles of OOP — Software evolution — OOP paradigm — basic Concepts of OOP's — Object oriented languages — applications of OOP (Chapter 1)

UNIT 2: Introduction of C++ - tokens, keywords, identifiers, variables, operators, manipulators, expression and control structures in C++ - main function in function prototyping — call by reference — return by reference — function overloading and virtual functions (Chapter 2,3 &4)

UNIT 3: Classes and objects - Constructors and destructors — operator overloading and type conversions, (Chapter 5, 6 &7)

UNIT 4: Inheritance — single inheritance — multilevel inheritance —multiple inheritances — hybrid inheritance. (Chapter 8)

UNIT 5: Pointer — virtual functions and polymorphism — managing console I/O operations (Chapter 9 & 10)

Text Book

Object oriented programming with C++ by E. Balagurusamy, 2e, Tarn. McGraw Hill publishing Co. Ltd., New Delhi.

Reference

1. C++ The Complete Reference by HerbeitSchildt.
2. OOP's with C++ from the foundation by N.R. Parsa, Dream Tech Press India Pvt. Ltd., New Delhi.

Learning Outcomes:

At the end of the course, the students should be able to:

- Able to understand and design the solution to a problem using object-oriented programming concepts.

- Able to reuse the code with extensible Class types, User-defined operators and function Overloading
- Understand functions and parameter passing.
- Understand object-oriented design and programming
- Understand dynamic memory allocation and pointers

Elective 1- FUZZY ANALYSIS

Course code	Course Title	L	T	P	C
20112DSC55A	Elective Paper – I Fuzzy Analysis	5	0	0	3

Objectives

Humans have a remarkable capability to reason and make decisions in an environment of uncertainty, imprecision, incompleteness of information, and partiality of knowledge, truth and class membership. The principal objective of **fuzzy logic** is formalization/mechanization of this capability.

UNIT I:

Fuzzy sets-basic types-basic concepts- α cuts-additional properties of α cuts-extension principle for fuzzy sets.

UNIT II:

Operation on fuzzy sets-types of operations- fuzzy complements-t-norms- fuzzy unions-combinations of operations.

UNIT III:

Fuzzy Arithmetic - Fuzzy numbers-Arithmetic operations on intervals Arithmetic operations on fuzzy numbers.

UNIT IV:

Fuzzy relations-Binary fuzzy relation-fuzzy equivalence relation-fuzzy compatibility relation-fuzzy ordering relations-fuzzy morphism.

UNIT V:

Fuzzy relation equation-general discussion-problem partitioning-solution method-fuzzy relation equations based on \sup_i compositions-fuzzy relation equations based on w_i compositions.

Reference

FUZZY SETS AND FUZZY LOGIC

J.KLIR AND BOYUAN.

PNI,NEWDELHI,2004.

Learning outcomes

By the end of this course, you should,

- Be able to get the knowledge and understand Classical Sets vs Fuzzy Sets (FS) – Types of FS – Operations on FS
- Be able to get the knowledge and understand Zadeh's Extension Principle
- Be able to get the knowledge and understand Fuzzy Relations – Fuzzy Relational Equations – Possibility Theory :
- Be able to get the knowledge and understand Fuzzy Measures. Fuzzy relation equations based on \sup_i compositions-fuzzy relation equations based on w_i compositions.

ELECTIVE - I - FORMAL LANGUAGES AND AUTOMATA THEORY

Course code	Course Title	L	T	P	C
20112DSC55B	Elective Paper-I-Formal Languages and Automata Theory	5	0	0	3

Objectives

1. The course aims to develop an appreciation of the theoretical foundations of computer science through study of mathematical and abstract models of computers and the theory of formal languages.
2. Theory of formal languages and use of various abstract machines as ‘recognizers’ and parsing will be studied for identifying the synthetic characteristics of programming languages.
3. To understand the fundamental models of computation that underlies modern computer hardware, software, and programming languages.
4. Explain computational thinking

Learn the foundations of automata theory, computability theory.

5. Discuss the applications of theory to other areas of computer science such as algorithms, programming languages, compilers, natural language translation, operating systems, and software verification.

UNIT I : The Theory of Automata — definition of an Automaton — Description of a finite Automaton — Transition system — properties of transition function — Acceptability of a string by a finite Automaton — Non deterministic finite state machine — the equivalence of DFA and NDFA — Mealy and Moore models — minimization of finite Automata.

UNIT II: Formal language — basic definition and examples — Chomsky classification of languages — language and their relation — recursive and recursively enumerable sets — operations on languages — languages and Automata.

UNIT III: Regular sets and regular grammars — regular expressions — finite Automaton and regular expressions — Pumping lemma for regular sets — application of pumping lemma.

UNIT IV: Context — free languages — context — free languages and derivation Trees — Ambiguity in context — free grammars — Simplification of context — free grammars — normal forms for context — free grammars.

UNIT V : Push Down Automata — basic definitions — Acceptance by PDA — Push Down Automata and context — free languages — parsing and Push down Automata.

Reference

K.L.P. Mishra and N. Chandrasekaran, “**Theory of Computer Science**”,
(Automata, languages and computation) — Prentice Hall of India private 2: limited — New Delhi, 3.

UNIT I : CHAPTER 2: (2.1 to 2.9)

UNIT II : CHAPTER 3: (section 3.1 to 3.6)

UNIT III : CHAPTER 4 : (section 4.1 to 4.4)

UNIT IV : CHAPTER 5: (section 5.1 to 3.4)

UNIT V : CHAPTER 6 : (section 6.1 to 6.4)

Learning outcomes

By the end of this course you should be able ,

- Design deterministic and non-deterministic machines.
- Design the pushdown automata.
- Comprehend the hierarchy of problems arising in the computer sciences.
- The Student will get an idea for designing Compiler Design.
- The students will get knowledge about regular expressions and computability theory
- Acquire a fundamental understanding of the core concepts in automata theory and formal languages.
- An ability to design grammars and automata (recognizers) for different language classes.
- An ability to identify formal language classes and prove language membership properties.
- An ability to prove and disprove theorems establishing key properties of formal languages and automata.

PROFESSIONAL SKILLS

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

The Course Professional Skills is divided into two parts:

- a) CareerSkills
- b) Team Skills

A. Career Skills

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

i. Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
- Difference between a CV, Resume and Bio data
- Essential components of a good resume

ii. Resume skills : common errors

- Common errors people generally make in preparing their resume
- Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

5Hours

i. Interview Skills : Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response(STAR Approach)for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview(open and closed ended questions)

ii. Interview Skills : Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

iii. Interview Skills : Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

- Meaning and methods of Group Discussion
- Procedure of Group Discussion
- Group Discussion-Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

- Knowing yourself – personal characteristics
- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

Reference

Please check IT-ITeS Sector Skills Council readiness programs namely

- Foundation Skills In IT (FSIT) -Refer the websites like <https://www.sscnasscom.com/Ssc-projects/capacity-building-and-development/training/fsit/and>
- GlobalBusinessFoundationSkills (GBFS)–Referwebsiteslike<https://www.sscnasscom.Com/ssc-projects/capacity-building-and-development/training>

B. Team Skills

Course Objectives:

The objectives of the course are to make learners:

1. Understand the significance of Team Skills and help them in acquiring them
2. To help them design, develop and adapt to situations as an individual and as a team.

Course Outcomes:

By the end of this course the learners/candidates will be able to:

1. Use common technology messaging tools that are used in enterprises for flow of information and transition from command and control to informal communication during an online/offline team session
2. Actively use and operate online team communication tools: Webinar, Skype, Zoom, Google hangout etc
3. Appreciate and demonstrate Team Skills
4. Participate in a digital lifestyle conversant with computers, applications, Internet and nuances of cyber security
5. Explore (online) and identify career opportunities in consideration of their own potential and aspirations.
6. Discuss and articulate the key requirements of an entrepreneurial exercise
7. Empathize and trust colleagues for improving interpersonal relations
8. Engage in effective communication by respecting diversity and embracing good listening skills
9. Distinguish the guiding principles for communication in a diverse, smaller internal world
10. Practice interpersonal skills for better relations with seniors, juniors, peers and stakeholders
11. Project a good personal image and social etiquette so as to have a positive impact on building of one's chosen career
12. Generate, share and maximise new ideas with the concept of brainstorming and the documentation of key critical ideas/thoughts articulated and action points to be implemented with timelines in a team discussion (as MOM) in identified applicable templates.

SEMESTER –VI

Core XIV - COMPLEX ANALYSIS

Course code	Course Title	L	T	P	C
20112AEC61	Core – XIV-Complex Analysis	5	0	0	3

Objectives:

This paper is an introduction to the theory of analytic functions of one complex variable. Properties of analytic functions, results on linear transformations, problems on complex integration are discussed. Calculus of residues are also studied.

UNIT — I: Analytic Functions:

Functions of complex variables-Limits theorems on limits-continuous functions functions-Differentiability-C.R. Equations-Analytic Functions Harmonic functions (section 2. 1 to 2.8)

UNIT — 2: Bilinear Transformations:

Elementary transformations-Bilinear Transformations-cross ratio-fixed points of bilinear transformations-Some special bilinear transformations. (Section 3. 1 to 3.5)

UNIT —3: Complex Integration:

Definite Integral-Cauchy's Theorem-Cauchy's integral formula-Higher derivations (Section 6.1 to 6.4)

UNIT — 4: Series Expansions:

Taylor's series-Laurent series-Zeros of analytic functions-Singularities (Section 7.1 to 7.4)

UNIT— 5: Calculus of residues:

Residues- Cauchy's Residue theorem — Evaluation of definite integrals (Section 8. 1 to 8.3)

Reference:

1. Complex Analysis by T.K. Manikavasakam Pillai & Others Ananda Book Depot. Madras.
2. Functions of Complex Variable by E.G. Philips.
3. Complex Variable by Dr. P.P. Gupta KedarNath Ram Nath Meerut — Delhi.
4. Functions of Complex Variable by J.N. Sharma Krishna PrakashanMandir Meerut.

Learning outcomes

By the end of this course you should be able

- Represent complex numbers algebraically and geometrically,
- Define and analyze limits and continuity for complex functions as well as consequences of continuity,
- Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra,
- Analyze sequences and series of analytic functions and types of convergence,
- Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula, and
- Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.

Core XV - DYNAMICS

Course code	Course Title	L	T	P	C
20112SEC62	Core –XV Dynamics	5	1	0	3

Course Objectives:

Develop an understanding of the principles of dynamics, and the ability to analyze problems in a systematic and logical manner. Ability to analyze the dynamics of particles, systems of particles and rigid bodies.

UNIT-I:

Kinematics velocity-Relative velocity-Acceleration –coplanar motion components of velocity & acceleration-Newton's laws of motion.

UNIT-II:

Simple harmonic motion-Simple pendulum-Load suspended by an elastic string-projectile-Maximum height reached, range, time of flight-projectile.

UNIT-III:

Impulsive force-conversion of linear momentum-impact of a sphere & a plane-Direct & oblique impact of two smooth sphere –kinetic energy and impulsive.

UNIT-IV:

Central orbit –central force-Differential EQUATION TO A CENTRAL ORBIT IN polar & pedal coordinates-Given the central orbit, to find the law of force-Kepler's laws of planetary motion's.

UNIT-V:

Motion of a rigid body-Moment of inertia of simple bodies-Theorem of parallel & perpendicular axes-motion in two dimension-motion of a rigid body about a fixed axis.

TEXT BOOKS:

1. P.DURAI PANDIAN, VECTOR TREATMENT AS IN MECHANICS,

Unit-I-Chapter 1 & cha 2 sec 2.1, 2.1.1

Unit-II-Cha 12 sec 12.1 to 12.3 & cha 13

Unit-III-Cha 14

Unit –IV-cha 16

Unit-V-Cha 4 sec 4.2 cha 17 & cha 18

General References:

Dynamics – Dr. K.ViswanathNaik and Dr. M.S. Kasi.

Course Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

A knowledge of internal forces and moments in members.

1. An ability to calculate centroids and moments of inertia.
2. A knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.
3. A knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.

Core XVI – DISCRETE MATHEMATICS

Course code	Course Title	L	T	P	C
20112AEC63	Core-XVI Discrete Mathematics	5	0	0	3

Objectives:

Discrete Mathematics is a bridge connecting various branches of Computer Science and Mathematics. In Discrete Mathematics, we essentially study various finite (discrete) structures of Mathematics which are essential to develop the various concepts of computer science.

UNIT 1 :

RELATIONS:

Cartesian Product of Two sets – Relations – Representation of Relation-Operations

Relations-Equivalence Relation

FUNCTIONS:

Function and Operators- One-to-One , Onto Functions-Special Types of Functions-

Invertible Functions- Compositions of Functions

UNIT 2:

LOGIC:

Introduction-TF –Statements-Connectives-Atomic and Compound Statements-Well

Formed (Statements) Formulae-Truth Table of a Formula- Tautology-Tautological

Implications and Equivalence of Formulae

UNIT 3:

LATTICES AND BOOLEAN ALGEBRA

Lattices – Some Properties of Lattices – New Lattices – Modular and Distributive

Lattices- Boolean Algebra

UNIT 4:

RECURRENCE RELATIONS AND GENERATING FUNCTIONS:

Recurrence an introduction – Polynomials and their Evaluations- Recurrence Relations-

Solution of Finite Order Homogeneous (liner) Relations-Solution of Non- homogeneous

Relations-Generating Functions-Some Common Recurrence Relations-Primitive

Recursive Functions- Recursive and Partial Recursive Functions

UNIT 5:

AUTOMATA, LANGUAGES AND COMPUTATIONS:

Introduction-Finite Automata- Definition of Finite Automaton –Representation of Finite

Automaton-Acceptability of a string by a Finite Automaton-Languages accepted by a

Finite Automaton-Non-deterministic Finite Automata- Acceptability of a String by Non-

Deterministic Finite Automata –Equivalence of FA and NFA

Text Books: Dr.M.K. Venkataraman and N. Sridharan.N.Chandrasekaran

For UNIT 1 - .Chapter 2: Section 2.1 to 2.21& Chapter 3 Section 3.1 to 3.13

For UNIT 2 - Chapter 9: Section 9.1 to 9.30

For UNIT 3 - Chapter 10: Section 10.1 to 10.34

For UNIT 4 - Chapter 5: Section 5.1 to 5.33

For UNIT 5 - Chapter 12: Section 12.1 to 12.18

Learning outcomes

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of Relations and functions
2. A knowledge of logical reasoning is used in mathematics to prove theorems, in computer science to verify the correctness of programs and to prove theorems in physical science to draw the conclusions..
3. An ability to find the solutions of Recurrence relations.
4. A knowledge of to study on ordering relations.

Elective II - GRAPH THEORY

Course code	Course Title	L	T	P	C
20112DSC64A	Elective Paper –II Graph Theory	5	0	0	3

Objectives:

Graph Theory is an integral part of Discrete Mathematics. It has applications to many fields, including computer science, physics, chemistry, psychology and sociology. In this course we teach basic topics in graph theory such as Trees, Directed graphs, Connectivity, Euler tours, Hamilton cycles, Matchings, Colourings, Planar graphs

UNIT 1: Definitions of graph — finite and infinite graphs — incidence and degree isolated and pendent vertices — isomorphism — sub graphs — walks, paths and circuits — Connected and disconnected graphs — components — Euler graphs — Operations on graphs — more on Euler graphs — Hamiltonian paths and circuits.

UNIT 2: Trees — Properties of trees — pendent vertices in a tree — distances and centers in a tree — Rooted and binary trees — Spanning trees — fundamental Circuits — Finding all spanning trees of a graph — Spanning trees in a weighted graph.

UNIT 3: Cut-sets — Properties of cut-set- All cut-sets in a graph — Fundamental circuits and cut-sets — connectivity and reparability.

UNIT 4: Planar graphs — Kuratowski's two graphs — Representation of a planar graph — Detection of planarity — Geometrical dual — Combinational dual.

UNIT 5: Matrix representation of graphs — Incidence Matrix — circuit matrix Fundamental circuit and matrix and rank of the circuit matrix — cut-set matrix — Adjacency matrix. Chromatic number — Chromatic partitioning — Chromatic polynomial. Treatment and content as in “Graph Theory with applications to engineering and computer science” by NarsingDeo, Prentice Hall of India, New Delhi.

References:

1. Invitation to graph Theory' by Dr.S. Arumugam and Dr. S. Ramachandran.
2. 'Graph Theory' — F. E-Haray, Narosa Publishing House, New Delhi — Madras - Bombay.
3. Graph Theory — S.A. Choudum, Macmillan India Limited —New Delhi — Madras.

Learning outcomes

By the end of this course, you should be able

- Knowledge in Graph Theory
- Understanding the properties of Graph Theory
- Understanding the concept of Kuratowski's graph
- Understanding Matrix representation of graphs

Elective II - MATHEMATICAL MODELLING

Course code	Course Title	L	T	P	C
20112DSC64B	Elective Paper –II Mathematical Modelling	5	0	0	3

Objectives:

Mathematical modelling can be used for a number of different reasons. How well any particular objective is achieved depends on both the state of knowledge about a system and how well the modelling is done.

1. Developing scientific understanding - through quantitative expression of current knowledge of a system.
2. Test the effect of changes in a system;
3. Aid decision making, including (i) tactical decisions by managers; (ii) strategic decisions by planners.

UNIT-I

Mathematical modeling through ordinary differential equations of first order: linear growth and decay models-nonlinear growth and decay models compartment models-dynamics problems-geometrical problems.

UNIT-II

Mathematical modeling through systems of ordinary differential equations of first order: population dynamics-epidemics-compartment models-economics-medicine. arms race, battles and international trade-dynamics.

UNIT-III

Mathematical modeling through ordinary differential equations of second order: planetary motions-circular motion and motion of satellites- Mathematical modeling through linear differential equations of second order-miscellaneous mathematical models.

UNIT-IV

Mathematical modeling through difference equations: simple models-basic theory of linear difference equations with constant coefficients-economics and finance population dynamics and genetics-probability theory.

UNIT-V

Mathematical modeling through Graphs: solutions that can be modeled through graphs-mathematical modeling in terms of directed graphs, signed graphs, weighted graphs and unoriented graphs.

Reference:

MATHEMATICAL MODELLING, J.N.KAPUR ,WILEYEASTERN LIMITED,
NEWDELHI,1988.

Learning Outcomes:

Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:

- 1) The concept of mathematical modelling.
 - 2) The mathematical descriptions of some real systems.
 - 3) Correct methodology when developing mathematical models.
 - 4) Skill in applications
 - 5) Designing and developing the solutions
-

Course Code	Course Title	L	T	P	C
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2

Unit I: Presentation Skills

- Types of presentations
- Internal and external presentation
- Knowing the purpose
- Knowing the audience
- Opening and closing a presentation
- Using presentation tools
- Handling questions
- Presentation to heterogenic group
- Ways to improve presentation skills overtime

Unit II: Trust and Collaboration

- Explain the importance of trust in creating a collaborative team
- Agree to Disagree and Disagree to Agree–Spirit of Teamwork
- Understanding fear of being judged and strategies to overcome fear

Unit III: Listening as a Team Skill

- Advantages of Effective Listening

Listening as a team member and team leader. Use of active listening strategies to encourage sharing of ideas (full and undivided attention, no interruptions, no pre- think, us **Credit Distribution**

- empathy, listen to tone and voice modulation, recapitulate points, etc.).**Unit IV: Brainstorming**

- Use of group and individual brainstorming techniques to promote idea generation.
- Learning and showcasing the principles of documentation of team session outcomes

Unit V: Social and Cultural Etiquette

- Need for etiquette (impression, image, earn respect, appreciation, etc)
- Aspects of social and cultural/corporate etiquette in promoting team work
- Importance of time, place, propriety and adaptability to diverse cultures

Unit VI: Internal Communication

- Use of various channels of transmitting information including digital and physical, to team members.

Reference:

Please check IT-ITeS Sector Skills Council readiness program namely Global Business Foundation Skills (GBFS) in website (<https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/>), and Generic and the entrepreneurial

COMMUNITY ENGAGEMENT

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	2

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and there by improve quality of learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

Unit I : Appreciation of Rural Society

Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages’ (Gandhi), rural infrastructure

Unit II : Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

Unit III : Rural Institutions

Traditional rural organizations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local

administration

Unit IV : Rural Development Programmes

History of rural development in India, current national programmes: SarvaShikshaAbhiyan, BetiBachao, BetiPadhao, Ayushman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram PanchayatDecentralised Planning, NRLM, MNREGA, etc.

Open Elective

Course Code	Course Title	L	T	P	C
201ENOEC	Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism

Objective:

- To instil in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub-editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist
- Explore the different kinds of news

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub-editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
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Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		

Course code	Course Title	L	T	P	C
201MAOEC	Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

KantiSwarup, P.K.Gupta and Manmohan, “Operations Research”

Course Code	Course Title	L	T	P	C
201PHGEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.

UNIT – I: INTRODUCTION

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges :
AC bridges – Maxwell, Owen, Schering and deSauty’s bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhney – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	Course Title	L	T	P	C
201CEOEC	Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislative aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.
High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

Introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	L	T	P	C
201CSOEC	E Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

Course Code	Course Title	L	T	P	C
201CAOEC	Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Introduction to the Internet: networking- internet – email – Internet Technologies: modem internet addressing .

UNIT II

Internet browsers: Internet Explorer – Netscape navigator- Introduction to HTML: Html document – anchor tag – hyperlink.

UNIT III

Head and body sections: Header section – titles – links- colorful web page – sample html document – Designing the body section: paragraph – tab setting.

UNIT IV

Ordered and unordered lists: list – unordered list – heading in a list- order list- nested list.

UNIT V

Table handling: tables – table creation in html cell spanning multiple rows and columns- coloring cells- sample tables- frames frame set definition- nested frames set.

REFERENCE BOOKS

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
201CMOEC	Open Elective – Banking Service	4	0	0	2

AIM:

To Provide the Bank is financial institution which is involved in borrowing and lending money.

OBJECTIVE:

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits- Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking- Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features- Registration- Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM- Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking, ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalthasuresh,Justinpaul .



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THANJAVUR – 613 403 - TAMILNADU

**M.Sc., MATHEMATICS
(2020-REGULATION)**

**Department
of
Mathematics**

1.1.3	Colour
	Employability
	Skill Development



M.Sc., MATHEMATICS – Regulation 2020

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
SEMESTER I					
20212AEC11	Algebra	6	0	0	4
20212AEC12	Real Analysis	7	0	0	4
20212AEC13	Ordinary Differential Equations	6	0	0	4
20220SEC14	C++ Programming	6	0	0	4
20212DSC15	Discipline Specific Elective – I	5	0	0	4
20212RLC16	Research Led seminar	1	1	1	1
	Total	30	0	0	21
SEMESTER II					
20212AEC21	Complex Analysis	5	1	0	4
20212AEC22	Measure Theory and Integration	5	0	0	4
20212SEC23	Mathematical Methods	6	0	0	4
20212AEC24	Graph Theory	5	0	0	4
20212DSC25	Discipline Specific Elective – II	5	0	0	4
20212RMC26	Research Methodology	3	0	0	2
20212BRC27	Participation in Bounded Research	-	-	-	2
	Total	29	1	0	24
SEMESTER III					
20212AEC31	Topology	6	0	0	5
20212SEC32	Stochastic Process	6	1	0	5
20212AEC33	Advanced Numerical Analysis	6	1	0	5
20212DSC34	Discipline Specific Elective – III	5	0	0	4
202__OEC	Open Elective	4	0	0	3
20212SRC36	Participation in Scaffold Research (Societal Project)	-	-	-	2
	Total	27	2	0	24
SEMESTER IV					
20212AEC41	Functional Analysis	5	1	0	5
20212SEC42	Visual Programming	6	1	0	5

20212AEC43	Number Theory	6	0	0	5
20212DSC44	Discipline Specific Elective – IV	5	0	0	4
20212PRW45	Project Work	0	0	0	6
20212PEE	Programme for Exit Examination	0	0	0	2
	Total	22	2	0	27
	Total Credits for the Programme				96

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	a) 20212DSC15A- Classical Dynamics b) 20212DSC15B- Fluid Dynamics
II	a) 20212DSC25A- Mathematical Probability b) 20212DSC25B- Mathematical Modelling
III	a) 20212DSC34A- Cryptography b) 20212DSC34B- Algebraic Coding Theory
IV	a) 20212DSC44A- Combinatorial Mathematics b) 20212DSC44B- Design And Analysis of Algorithm

Open Electives

Semester	Open Elective Courses
III	a) 20211OEC-Writing For the Media b) 20213OEC-Bio-medical Instrumentation c) 20214OEC-Green Chemistry d) 20215OEC-Herbal Medicines e) 20220OEC-M-Marketing f) 20261OEC- Financial Service g) 20280OEC-Counselling and Psychology

Credit Distribution:

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	12	04	04	-	01	-	21
II	09	03	04	-	05	-	21
III	10	05	04	02	02	-	23
IV	10	05	04	-	06	02	29
Total	41	17	16	02	14	02	92

J. C. Divakar

H.O.D.

M.Sc., MATHEMATICS SYLLABUS

SEMESTER – I Core I: ALGEBRA

Course Title
20212AEC11 Core –I - Algebra

Objectives:

1. Group Theory is the fundamental building blocks for the Abstract Algebra.
2. To study the algebraic aspects of Real and Complex numbers.
3. Module is a third algebraic Model - Applicable to geometry and physics.

UNIT I:

Group theory: Sylow's theorem — direct products — finite abelian groups.

UNIT II:

Ring theory: Polynomial rings — polynomials over the rational field polynomial ring over commutative rings — modules.

UNIT III:

Field: Extension fields — roots of polynomials — more about roots

UNIT IV:

Field: the elements of Galois theory — Finite fields

UNIT V:

Linear transformations — the algebra of linear transformations, Hermitian, Unitary and normal transformations.

Reference

1. Topics in Algebra — I.N. Herstein

Learning Outcomes:

1. Understand the concept of Group Theory, Ring Theory.
 2. A knowledge of Linear Transformations.
 3. An understanding of the analysis of Fields.
 4. Research inquiry and analytical thinking abilities
-

Course Title
20212AEC12 Core –II Real Analysis

Objectives:

1. To introduce the notion of Riemann – Stieltjes integral.
2. To study the infinite series and infinite sequences of functions.
3. To study the multivariate differential calculus.

UNIT I:

Riemann — Stieltjes — integral

UNIT II:

Infinite series and infinite products

UNIT III:

Sequences of functions

UNIT IV:

Multivariable Differential Calculus

UNIT V:

Implicit functions and Extremum problems

Reference:

Mathematical Analysis Tom. M.Apostol. 2nd Edition Narosa Publishing House— 1985

Unit I Chapter— 7(7.1—7.25)

Unit II Chapter — 8(8.1 — 8.18)

Unit III Chapter — 9(9.1 — 9.6, 9.8-9.13)

Unit IV Chapter— 12(12.1—12.5, 12.7— 12.14)

Unit V Chapter— 13(13.1 — 13.6)

Learning Outcomes:

Students will be able to

1. Know the notion of the Riemann-Stieltjes integral, prove elementary properties of the Riemann integral and the Fundamental Theorem of Calculus.
2. Describe the Infinite series and Infinite Products, Sequences of Functions.
3. An understanding of Multivariable Differential Calculus and Implicit Functions and Extremum problem.

Course Title
20212AEC13 Ordinary Differential Equations

Objectives:

1. Teaching the theory and applications to students preparing for advanced training in applied sciences and social sciences.
2. Presenting in easy and lucid language the results of oscillations, boundary value problems (BVP) and elements of control theory.
3. Justifying the inclusion of qualitative theory to students who think it is out of place.
4. Emphasizing the importance of the study of Boundary problems, both in Mathematics and applied sciences.
5. Studying about the stability of stationary solutions.

UNIT I:

Systems of linear differential equations — Chapter 4

UNIT II:

Existence and uniqueness of solutions Chapter 5

UNIT III:

Boundary value problems — Chapter — 7

UNIT IV:

Oscillations of second order equations — Chapter 8

UNIT V:

Stability of linear and nonlinear system — Chapter 9

Reference

Ordinary differential Equations and Stability Theory — S.G.GEO. V.Ragavendra, V.Lakshmikanthan

Learning Outcomes :

Upon completing this course students should be able to:

1. Solve first order equations, systems of periodic coefficients and use these methods to solve applied problems.
2. A knowledge of Sturm-Liouville Problem.
3. Understanding about the stability of stationary solutions.

Course Title
20220SEC14
C++ Programming

Objectives

- Utilise Object Oriented techniques to design C++ programs.
- Use the standard C++ library.
- Exploit advanced C++ techniques

UNIT 1:

Beginning with C++ - what is C++ - applications — simple program — structure of C program — creating the source file — compiling and linking — tokens, expressions and control structures — user defined data types — derived data types — declarations of variables — reference — variables

UNIT II:

Operations in C++ - Manipulators — types cast operator — expressions and implicit conversions — operator over loading — operator precedence — control structures — Functions in C — the main function — functions prototyping, call by reference — return by reference — function overloading

UNIT III:

Class and object — introduction — C structures revisited — C++ program with class — arrays within class — static member function — arrays of objects — returning objects — returning objects — constant member functions — pointers to members.

UNIT IV:

Constructors and destructors — introduction — constructors — parameterized constructors — multiple constructors in a class — copy constructor — dynamic constructor — two dimensional Arrays — destructors — operators over loading and type conversions — defining operator loading — manipulation strings using operations — type conversions.

UNIT V:

Inheritance: extending classes — introduction — defining derived classes — single inheritance — multiple inheritance — virtual base classes — abstract classes — nesting classes.

Reference:

Object Oriented Programming with C++ - E.Balagurusamy.

Learning Outcomes:

At the end of the course, the student should be able to:

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to reuse the code with extensible Class types, User-defined operators and function Overloading
- Understand functions and parameter passing.
- Understand object-oriented design and programming
- Understand dynamic memory allocation and pointers

Course Title
20212DSC15A
Elective Classical Dynamics

Objectives.

1. Classical mechanics afford the student an opportunity to master many of mathematics techniques.
2. It is certainly true that classical mechanics today is far from being a closed subject.
3. Alternative means exist in the curriculum for acquiring the mathematics needed in other branches.

UNIT I:

Introductory Concepts—Chapter 1(1.1 — 1.5)

UNIT II:

Lagrange's equations — Chapter 2

UNIT III:

Special applications of Lagrange's equations — Chapter 3

UNIT IV:

Hamilton equations — Chapter 4

UNIT V:

Hamilton Jacobi theory — Chapter 5

Reference

CLASSICAL DYNAMICS — Donald T.Greenwood, PHI, India.

Learning Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of mechanical systems , virtual work Energy and Momentum.
 2. Understanding the concept and Applications Lagrange's Equation.
 3. A knowledge of Hamilton's Principal function.
-

Course Title
20212DSC15B Elective- Fluid Dynamics

Objectives:

1. To introduce the behavior of fluid in motion.
2. To study the application of complex analysis in the analysis of flow of fluids.

UNIT I

Real fluids and ideal fluids — velocity of a fluid at a point — streamlines and path lines: steady and unsteady flows — the velocity potential — The velocity vector — local and particle rates of change — the Equations of continuity — Worked examples — Accelerations of a fluid — Pressure at a point in a fluid at rest — Pressure at a point in moving fluids — Conditions at a Boundary to two inviscid immiscible fluids — Euler's equations of motions — Bernoulli's equation — worked examples.

UNIT II

Some flows involving axial symmetry — some special two — Dimensional flow — impulsive Motion. Some three — dimensional flows: Introductions — sources, sinks and doublets — images in a rigid infinite plane — Axis-symmetric flows: Stokes stream functions.

UNIT III

Some two — Dimensional Flows: meaning of a two — Dimensional flow — Use of cylindrical polar coordinates — The stream function — The complex potential for two Dimensional, irrotational, incompressible flow — complex velocity potentials for standard two — dimensional flows — some worked examples — The Milne — Thomson circle theorem and applications — The theorem of Blasius.

UNIT IV

The use of conformal transformation and Hydrodynamical Aspects — stress components in real fluids — relations between Cartesian components of stress — Translational motion of fluid element — The rate of strains Quadratic and principal stresses — Some further properties of the rate of strains quadratic — stress Analysis in fluid motion — Relations between stress and rate of strain — The coefficient of viscous fluids

UNIT V

Some solvable problems in viscous flow — steady viscous flow in tubes of uniform cross section — Diffusion of vorticity — Energy. Dissipation due to viscosity — steady flow past a fixed sphere — Dimensional Analysis; Reynolds Number — Prandtl's Boundary layer.

Reference:

Fluids dynamics by F. Chorlton (CBS Publisher & Distributors, Delhi- 110032) 1985.

- Unit I : Chapter 2. Sec 2.1 to 2.9 and Chapter 3. Sec 3.1 to 3.6
Unit II : Chapter 3. Sec 3.9 to 3.11 and Chapter 4. Sec 4.1, 4.2, 4.3, 4.5
Unit III : Chapter 5. Sec 5.1 to 5.9 except 5.7
Unit IV : Chapter 5. Sec 5.10 and Chapter 8. Sec 8.1 to 8.9
Unit V : Chapter 8. Sec 8.10 to 8.16

General References

Fluids Dynamics Shantny Swarup, Krishna Prakasan Mandir Meerut 1984.

Learning Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of behaviour of fluid in motion.
 2. A knowledge of Two Dimensional and conformal mapping.
 3. A knowledge of solving problems in viscous flow-steady viscous flow
-

SEMESTER – II

Course Title
20212AEC21
Complex Analysis

Objectives:

1. To introduce the students to the fascinating world of complex analysis which is different from analysis of real variable.
2. To introduce the concepts of harmonic functions , elliptic functions and periodic functions.

UNIT I:

Harmonic functions — power series expansions partial fraction and factorization — entire functions.

UNIT II:

The Riemann zeta function — normal families.

UNIT III:

The Riemann mapping theorem — conformal mapping of polygons — Chapter 6(6.1, 6.2)

UNIT IV:

A closer look at harmonic functions — the Dirichlet's problem Harmonic measures — Chapter 6 sec 3.4 and 5(5.1 only)

UNIT V:

Simple periodic functions — double periodic functions — the weierstrass theory Chapter 7 sec 1,2,3(3.1, 3.2, 3.3)

Reference

Complex Analysis L.V. Ahlfors 3rd edition McGraw Hill

Learning Outcomes:

On completion of this unit successful students will be able to:

1. Understand the significance of harmonic functions, Riemann zeta function.
2. A knowledge of periodic functions, the weierstrass
3. Research inquiry and analytical thinking abilities
4. Abilities in conformal mapping

Course Title
20212AEC22 Measure Theory and Integration

Objectives:

To gain understanding of the abstract measure theory and definition and main properties of the integral. To construct Lebesgue's measure on the real line and measurability in product space. To explain the basic advanced directions of the theory.

UNIT I

Measure on Real line — Lebesgue outer measure — Measurable sets — Regularity — Measurable function — Borel and Lebesgue measurability.

UNIT II

Integration of non-negative functions — The General integral — Integration of series — Riemann and Lebesgue integrals.

UNIT III

Abstract Measure spaces — Measures and outer measures — Completion of a measure — Measure spaces — Integration with respect to a measure.

UNIT IV

Convergence in Measure — Almost uniform convergence — Signed Measures and Hahn Decomposition — The Jordan Decomposition.

UNIT V

Measurability in a Product space — The product Measure and Fubini's Theorem.

Reference:

[I] G.De Barra, Measure Theory and Integration, New age international (p) Limited.

UNIT — I : Chapter II: Sections 2.1 to 2.5

UNIT—II : Chapter III: Sections 3.1 to 3.4

UNIT — III : Chapter V: Sections 5.1 to 5.6

UNIT— IV : Chapter VII: Sections 7.1 to 7.2, Chapter VIII: Sections 8.1 and 8.2

UNIT —VI : Chapter X: Sections 10.1 to 10.2

Reference(s)

1. Measure and Integration. Second Edition by M.E.Munroe Addison — Wesley publishing company, 1971.
2. P.K.Jain, V.P.Gupta, Lebesgue Measure and integration, New Age International Pvt Limited Publishers, New Delhi, 1986. (Reprint 2000)
3. Richard L. Wheeden and Antoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc. 1977.
4. Inder, K.Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi, 1997.

Learning Outcomes:

To introduce the concepts of *measure* and *integral with respect to a measure*,

To show their basic properties,

To provide a basis for further studies in Analysis, Probability, and Dynamical Systems.

Knowledge in measure spaces

Course Title
20212AEC23 Mathematical Methods

Objectives:

To introduce the concept of Calculus of variations, Fourier Transforms, Hankel Transform, Linear Integral Equations, Method of successive approximations.

UNIT I

Calculus of variations — Maxima and Minima — the simplest case — Natural boundary and transition conditions variational notation — more general case — constraints and Lagrange’s multipliers — variable end points — Sturm - Liouville problems.

UNIT II

Fourier transform — Fourier sine and cosine transform — Properties Convolution — Solving integral equations — Finite Fourier transform — Finite Fourier sine and cosine transforms — Fourier integral theorem Parseval’s identity.

UNIT III

Hankel Transform: Definition - Inverse formula — Some important results for Bessel function — Linearity property — Hankel Transform of the derivatives of the function — Hankel Transform of differential operators — Parsavaj’s Theorem.

UNIT IV

Linear Integral Equations — Definition, Regularity conditions — special kind of kernels — eigen values and eigen functions — convolution integral — the inner and scalar product of two functions — Notation — reduction to a system of Algebraic equations — examples — Fredholm alternative — examples — an approximate method.

UNIT V

Method of successive approximations: Iterative scheme — examples — Volterra Integral equation examples — some results about the resolvent kernel. Classical Fredholm Theory: the method of solution of Fredholm — Fredholm’s first theorem — second theorem — third theorem.

References

1. Ram.P.Kanwal — Linear Integral Equations Theory and Practise, Academic Press 1971.
2. F.B.Hildebrand. Methods of Applied Mathematics II ed. PHI, ND 1972.
3. A.R.Vasishtha. R.K.Gupta, Integral Transforms, Krishna Prakashan Media Pvt Ltd. India, 2002.

- UNIT — I : Chapter 2:Sections 2.1 to 2.9 of [2]
- UNIT — II : Chapter 7 of [3]
- UNIT — III : Chapter 9 of [3]
- UNIT— IV : Chapter 1 and 2 of [1]
- UNIT—V : Chapter 3 and4 of [1]

Learning Outcomes:

On completion of this unit successful students will be able to:

1. Understand the significance of Calculus of Variations, Fourier Transforms and Hankel Transform.
 2. A knowledge of linear integral equations and Method of successive approximations.
 3. Skillness in transformation form one function into another function
 4. Applications
-

Course Title
20212AEC24 Graph Theory

Objectives

1. To give a rigorous study of the basic concepts of Graph Theory.
2. To study the applications of Graph Theory in other disciplines.

UNIT I

Basic Results Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness Operations on Graphs - Directed Graphs:

UNIT II

Connectivity Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, **Trees: Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula.**

UNIT III

Independent Sets and Matchings Vertex Independent Sets and Vertex Coverings - Edge Independent Sets - Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs.

UNIT IV

Graph Colourings Vertex Colouring - Critical Graphs - Triangle - Free Graphs - Edge Colourings of Graphs - Chromatic Polynomials.

UNIT V

Planarity Planar and Nonplanar Graphs - Euler Formula and its Consequences - K_5 and $K_{3,3}$ are Nonplanar Graphs - Dual of a Plane Graph - The Four-Colour Theorem and the Heawood Five-Colour Theorem-Kuratowski's Theorem.

Textbook

1. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008.

UNIT I Chapter I & II: 1.1 to 1.4, 1.7, 2.1, 2.2

UNIT II Chapter III & IV: 3.1, 3.2, 4.1, 4.3 to 4.4

UNIT III Chapter V & VI: 5.1 to 5.4, 6.1, 6.2

UNIT IV Chapter VII: 7.1 to 7.4, 7.7

UNIT V Chapter VIII: 8.1 to 8.6

References 1. J.A. Bondy, U.S.R. Murty, Graph Theory with Applications, Mac Milan Press Ltd., 1976.

2. Gary Chartrand, Linda Lesniak, Ping Zhang, Graphs and Digraph, CRC press, 2010.

3. F. Harary, Graph Theory, Addison - Wesley, Reading, Mass., 1969.

Course Title
20212DSC25A
Elective -Mathematical Probability

Objectives:

The goal of the subject is to extend and master students' knowledge of probability and statistical and to provide theoretical background for studying and applying advanced statistical methods. Students are introduced to probability theory and mathematical statistics. They learn to understand important distributions, present statistical data, and fundamental statistical concepts. Emphasis is placed on evaluation the processes encountered in the real reality and on formulation of problems that are investigated by sampling.

UNIT I

Measure theory — Classes of sets. Singular distributions Probability measures and their distribution functions.

UNIT II

Random Variables — Expectation — Independence — General Definitions — Properties of mathematical expectation — Independence.

UNIT III

Convergence concept — Various modes of convergence — Almost sure convergence — Borel — Cantelli lemma — Vague convergence — continuation — Uniform integrability — convergence of moments.

UNIT IV

Law of large numbers and random series — simple limits theorem's — weak law of large numbers — convergence of series — strong law of large numbers.

UNIT V

Characteristic function — General properties — convolutions — Uniqueness and inversion — convergence theorems.

Reference

A course in Probability Theory — Second Edition — by Kai Lai Chung, Academic Press, New York

- Unit I : Chapter 2
- Unit II : Chapter 3
- Unit III : Chapter 4
- Unit IV : Chapter 5 (Sec.5.1 to 5.4 Only)
- Unit V : Chapter 6 (Sec.6.1 to 6.3 Only)

GENERAL REGERENCE

Modern Probability theory — BR.Bhat, Willy Eastern Limited 0989).

Learning Outcomes:

Knowledge and understanding understand the place of probability theory knowledge in cognitive process, describe the basic probability theory and mathematical statistics concepts; Special abilities and skills.

1. Calculate the probabilities of events with an appropriate choice of the method of calculation;
2. Be familiar with the types of random variables, be able write them, calculate their numerical characteristics;

3. Evaluate numerical characteristics of the sample and interpret the meanings of the parameters of population.
 4. Formulate and test hypotheses, draw the appropriate conclusions.
 5. Understand impotent distribution
-

Course Title
20212DSC25B
Elective- Mathematical Modelling

Objectives:

Mathematical modelling can be used for a number of different reasons. How well any particular objective is achieved depends on both the state of knowledge about a system and how well the modelling is done.

1. Developing scientific understanding - through quantitative expression of current knowledge of a system.
2. Test the effect of changes in a system;
3. Aid decision making, including (i) tactical decisions by managers; (ii) strategic decisions by planners.

UNIT I

Microbial population models, single-species, non — age — structured population models.

UNIT II

Age — structured population models.

UNIT III

Epidemic models.

UNIT IV

Models in genetics.

UNIT V

Mathematical models in Pharmacokinetics.

Reference:

Mathematical models in Biology and Medicine By J.N.Kapur, Affiliated East — West Press Pvt. Ltd., New Delhi

- Unit I : Chapter 2,3
- Unit II : Chapter 4
- Unit III : Chapter 8
- Unit IV : Chapter 9
- Unit V : Chapter 10

General References

1. Mathematical Modelling J N Kapur Wiley Eastern Ltd New Delhi.
2. Theory of Ordinary Differential Equations with Equations with applications in biology and Engineering Ahmad & Mohana Rao Affiliated East — West Pvt Ltd New Delhi, (1999).

Learning Outcomes:

Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:

- 1) The concept of mathematical modelling.

- 2) The mathematical descriptions of some real systems.
 - 3) Correct methodology when developing mathematical models.
 - 4) Skill in applications
 - 5) Designing and developing the solutions.
-

20212RMC26 **Research Methodology**

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in MATLAB platform for basic computational programming and analysis

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I: Introduction to Research Methodology

Objectives of research – Types of research – Significance of research. Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT II: Database and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT III: Data Analysis :

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – Normal distribution curve – Statistical treatment of finite samples – t test and F test (ANOVA) co -variance (ANCOVA) correlation and multiple regression.

UNIT IV: Thesis and Paper writing:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

UNIT V: Application of MATLAB:

Numerical Integration - Numerical integration, ordinary differential equations, partial differential equations, boundary value problems

Fourier Analysis - Fourier transforms, convolution.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and Experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by by William J. Palm III

SEMESTER – III

Course Title
20212AEC31 Core IX- Topology

Objectives:

- 1) The subject of topology is of interest in its our right and it also serves to lay the foundations for future study in analysis, in Geometry and in Algebraic Topology.
- 2) To develop the students' abilities through hard thinking.
- 3) To train the students to develop analytical thinking.

UNIT I

TOPOLOGICAL SPACES: Topological spaces' — Basis for a topology- The order topology — The product topology on $X \times Y$ — The subspace topology — Closed sets and limit points.

UNIT II

CONTINUOUS FUNCTIONS: Continuous functions — the product topology — The metric topology.

UNIT III

CONNECTEDNESS: Connected spaces — connected subspaces of the Real line — Components and local connectedness.

UNIT IV

COMPACTNESS: Compact spaces — compact subspaces of the Real line — Limit Point Compactness — Local Compactness.

UNIT V:

COUNTABILITY AND SEPERATION AXIOMS: The Countability Axioms — The separation Axioms — Normal spaces — The Urysohn Lemma — The Urysohn metrization Theorem — The Tietz extension theorem.'

Reference:

James R.Munkres, Topology(2nd Edition) Pearson Education Pvt. Ltd., New Delhi — 2002 (Third Indian Reprint)

UNIT — I Chapter 2: Sections 12 to 17

UNIT — II Chapter 2: Sections 1 8to 21(Ornit Section 22)

UNIT — III Chapter 3: Sections 23 to 25

UNIT — IV Chapter 3: Sections 26 to 29

UNIT — V Chapter 4: Sections 30 to 35.

Reference(s)

1. J.Dugundji, Topology, Prentice Hall of India, New Delhi, 1975.
2. George F.Sinmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co., 1963.

3. J.L.Kelly, General Topology, Van Nostrand, Reinhold Co., New York.
4. L.Steen and J.Seeback, Counter examples in Topology, Holt, Rinehart and Winston, New York, 1970
5. S.Willard, General Topology, Addison — Wesley, Mass., 1970.

Learning Outcomes:

Upon successful completion of this course, the student will be able to: (Knowledge based)
distinguish among open and closed sets on different topological spaces;

- 1) know the two fundamental topologies: discrete and indiscrete topologies.
 - 2) Identify precisely when a collection of subsets of a given set equipped with a topology forms a topological space;
 - 3) Understand when two topological spaces are homeomorphic;
 - 4) Identify the concepts of distance between two sets; connectedness, denseness, compactness and separation axiom.
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Course Title
20212AEC32 Core X – Stochastic Process

Objectives

The objective of this course is to provide the fundamentals and advanced concepts of random process to support graduate coursework and research in engineering. The required mathematical foundations will be studied at fairly rigorous level and the applications of the probability theory and random processes to engineering problems will be emphasized. The simulation techniques will also be studied and MATLAB will be used as a software tool for bridging the probability theory and engineering applications.

UNIT I

Elements of Stochastic Processes — Two simple examples of Stochastic processes — Classification of general Stochastic processes — Defining a Stochastic Processes — Markov chains — Definitions — Examples of Markov Chain — Transition probability matrices of a Markov chain — classification of states of a Markov chain — Recurrence — more on Recurrence.

UNIT II

The basic limit theorem of Markov chains and applications — Discrete renewal equation — proof of theorem — Absorption probabilities — criteria for recurrence — Random walk.

UNIT III

Classical Examples of continuous time Markov chains — General pure birth processes and Poisson processes — more about Poisson processes — A counter model — birth and death processes — Differential equations of birth and death processes — Examples of birth and death processes.

UNIT IV

Renewal processes — Definition of Renewal process and related concepts — Some examples of Renewal Processes — More on some special Renewal processes — Renewal equations and elementary Renewal theorem — The Renewal Theorem — Applications of Renewal theorem.

UNIT V

Martingales — Preliminary definitions and examples — Super martingales and Sub martingales — The optional sampling theorem.

Reference

A First course in Stochastic Processes — second Edition by Samuel Karlin and M. Taylor, Academic Press New York.

Unit I : Chapter1(1.2,1.3,1.4 Only) , Chapter 2 (2.1 to 2.5 and 2.7 Only)

Unit II : Chapter 3 (3.1 to 3.4 and 3.7 Only)

Unit III : Chapter 4 (4.1 to 4.6 Only)

Unit IV : Chapter 5 (5.1 to 5.6)

Unit V : Chapter6(6.1,6.2,6.3 Only)

General references

1. “Stochastic Processes” S.K Srinivasan and K.M. Mehata, Tata Mcgraw — Hill Publishing Company Ltd., New Delhi.
2. “Stochastic Processes” JMedhi, Second Edition Wiley Eastern Ltd., New Del/it

Learning Outcomes

1. On successful completion of the course, students should be able to:

2. Explain fundamentals of probability theory, random variables and random processes.
3. Understand the mathematical concepts related to probability theory and random processes
- 4, Understand the characterization of random processes and their properties.
5. Formulate and solve the engineering problems involving random processes.
6. Analyze the given probabilistic model of the problem.
7. Make precise statements about random processes.
8. Use computational techniques to generate simulation results.

Course Title
20212AEC33 Advanced Numerical Analysis

Objectives:

- 1) Derive appropriate numerical methods to solve algebraic and transcendental equations.
- 2) Develop appropriate numerical methods to solve a differential equation.
- 3) Derive appropriate numerical methods to evaluate a derivative at a value.
- 4) Derive appropriate numerical methods to solve a linear system of equations.
- 5) Derive appropriate numerical methods to calculate a definite integral.

Unit – I

Transcendental polynomials equation: Introduction, Methods based on first and second degree equation: secant method - Newton Raphson method - Muller method - Chebyshev method - Rate of convergence. Polynomials Equations: Birge-Vieta method - Bairstow method - Graeffe's root squaring method.

Unit – II

System of linear algebraic equation and Eigen values problems: Jacobi iteration method, Gauss-Seidal iteration method successive over relaxation method. Eigen values and vectors.

Unit – III

Interpolation and approximation – Hermite Interpolation – Bivariate interpolation – Lagrange bivariate interpolation- Newton's bivariate Interpolation for equispaced points – approximations – Gram-Schmidt orthogonalizing process – Chebyshev polynomials.

Unit – IV

Numerical Integration: Methods based on interpolation-Newton-Cotes methods-trapezoidal rule-Simpson's rule-Methods based on undetermined coefficients-Gauss-Legendre integration methods-Labotto integration method-Radau Integration Method and Gauss-Chebystew Integration methods.

Unit – V

Ordinary Differential Equations: Numerical methods – Euler method – Backward Euler method – Mid point method – Taylor series method – Runge Kutta methods – Implicit Runge – Kutta method.

TEXT BOOK:

Numerical methods for scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain III – Edition.

- Unit: I – Chapter-2 Sec 2.3, 2.4, 2.5, 2.8
 Unit: II – Chapter-3 Sec 3.4, 3.5, 3.6
 Unit: III – Chapter-4 Sec 4.5, 4.7, 4.8
 Unit: IV – Chapter-5 Sec 5.6, 5.7, 5.8
 Unit: V – Chapter-6 Sec 6.2, 6.3, 6.4.

Learning Outcomes

Students will be able to

- 1) Solve an algebraic or transcendental equation using an appropriate numerical method.
- 2) Solve a differential equation using an appropriate numerical method.
- 3) Evaluate a derivative at a value using an appropriate numerical method.
- 4) Solve a linear system of equations using an appropriate numerical method.
- 5) Calculate a definite integral using an appropriate numerical method.
- 6) Skill in finding the roots of the given equation

Course Title
20212DSC34A Elective- Cryptography

Objectives:

- 1) Understand the basic concept of Cryptography and Network Security their mathematical models.
- 2) Understand mathematical foundation required for various cryptographic Algorithms.

UNIT I:

Simple cryptosystem — enciphering matrices.

UNIT II:

Idea of public key cryptography — RSA — discrete log.

UNIT III:

Knap sack pseudo primes — Rho method

UNIT IV:

Fermat factorization and factor bases — continued fraction method.

UNIT V:

Basic facts — elliptic curve cryptosystems — elliptic curve factorization.

Reference:

A course in Number Theory and Cryptography — N.Koblitz, Springer — verlog, New York 1987.

Learning Outcomes

- 1) Analyze key agreement algorithms to identify their weaknesses.
 - 2) Describe the ethical issues related to the misuse of computer security.
 - 3) Develop code to implement a cryptographic algorithm or write an analysis report on any existing security product.
-

Course Title
20212DSC34B Elective- Algebraic Coding Theory

Objective:

- To equip students with the basic understanding of the fundamental concept of Coding Theory as they are used in communications.
- To enhance knowledge of codes. Error, Tree Codes, cyclic codes.
- To guide the student through the implications and consequences of fundamental theories and laws of coding theory with reference to the application in modern communication and computer systems

UNIT I

The communication channel. The coding problem. Types of codes. Block codes. Error — detecting and Error — Correcting codes. Linear codes. The hamming metric. Description of linear block codes by matrices. Dual codes. Standard Array. Syndrome. Step — by — step decoding modular representation.

UNIT II:

Error — Correction capabilities of linear codes. Bounds on minimum Distance for block codes. Plotkin bound. Hamming sphere packing bound. Varshamov — Gilbert — Sacks bound. Bounds for Burst — Error detecting and correcting codes. Important linear block codes. Hamming codes. Golay codes. Perfect codes. Quasi — perfect codes. Reed — Muller codes. Codes derived from Hadmard matrices. Product codes. Concatenated codes.

UNIT III:

Tree codes. Convolutional codes. Description of linear tree and convolutional codes by matrices. Standard Array. Bounds on minimum distance for convolutional codes. V. G. S bound. Bounds for Burst — error detecting and correcting convolutional codes. The Lee metric, packing bound for Hamming code w.r.t. Lee metric. The Algebra of polynomial residue classes. Galois fields. Multiplicative group of a Galois field. Cyclic codes. Cyclic codes as ideals.

UNIT IV:

Matrix description of cyclic codes. Hamming and Golay codes as cyclic codes. Error detection with cyclic codes. Error — connection procedure for short — ended cyclic codes. Pseudo cyclic codes. Code symmetry. Invariance of codes under transitive group of permutations. Bose — Chaudhary — Hocquenghem (BCH) codes. Reed — Soloman (RS) codes.

UNIT V:

Majority — Logic decodable codes. Majority — Logic Decoding. Singleton bound. The Griesmer bound, Maximum — distance separable (MDS) codes. Generator and Parity — check matrices of MDS codes. Weight distribution of MDS code. Necessary and sufficient conditions for a linear code to be an MDS code. MDS codes from RS codes. Abramson codes. Closed — loop burst — error correcting codes (fire codes). Error locating codes.

References

1. Raymond Hill, ' A First Course in Coding Theory "Oxford University Press. 1986.
2. Man Young Rhee, Error Correcting Coding Theory " MacGraw Hill Inc., 1989.
3. W.W. Peterson and E.J. Weldon, Jr., Error — Correcting Codes. M.I.T. Press. Combridge, Massachusetts, 1972.
4. E.R. Beriekamp. Algebraic Coding Theory, MacGraw Hill Inc., 1968.
5. F.J. Macwilliams and N.J.A. Sloane, Theory of Error Correcting Codes" North — Roland Publishing Company, 1977.

Learning Outcomes

Upon completion of this course, students should be able to:

- 1) Define channel capacities and properties using Shannon's Theorems.
- 2) Construct efficient codes for data on imperfect communication channels.
- 3) Generalize the discrete concepts to continuous signals on continuous channels.

SEMESTER – IV

Course Title
20212AEC41 Core XII-Functional Analysis

Objectives:

- 1) To study about Converges, Hilbert spaces and Bessels's inequality.
- 2) To study about Spectral Theory.
- 3) To study about convergences in $L(X,Y)$ – Uniform boundedness and The Gelfand Neumark theorem and Banach Algebra.

UNIT I

Algebraic Systems: Groups — Rings — The structure of rings — Linear spaces - The dimension of a linear space — Linear transformations — Algebras — Banach Spaces : The definition and some examples — Continuous linear transformations — The Hahn — Banach theorem — The natural imbedding of N in N^{**} - The open mapping theorem — The conjugate of a operator.

UNIT II

Hilbert Spaces: The definition and some simple properties — Orthogonal complements — Orthonormal sets — The conjugate space H^* - The adjoint of an operator — Self-adjoint operators — Normal and unitary operators — Projections.

UNIT III

Finite-Dimensional Spectral Theory: Matrices — Determinants and the spectrum of an operator — The spectral theorem — A survey of the situation.

UNIT IV

General Preliminaries on Banach Algebras: The definition and some examples — Regular and singular elements — Topological divisors of zero — The spectrum — The formula for the spectral radius — The radical and semi- simplicity.

UNIT V

The Structure of Commutative Banach Algebras: The Gelfand mapping — Applications of the formula $r(x) = \lim \|x^n\|^{1/n}$ - Involutions in Banach Algebras — The Gelfand-Neumark theorem.

Reference:

Introduction to Topology and Modern Analysis, G.F.Simmons, McGraw-Hill International Ed. 1963.

UNIT-I	:	Chapters 8 and 9
UNIT-II	:	Chapter 10
UNIT-III	:	Chapter II
UNIT-IV	:	Chapter 12
UNIT-V	:	Chapter 13

Reference(s)

1. Walter Rudin, Functional Analysis, TMH Edition, 1974.
2. B.V.Limaye, Functional Analysis, Wiley Eastern Limited, Print, 1985.
3. K.Yosida, Functional Analysis, Springer-Verlag, 1974.
4. Laurent Schwartz, Functional Analysis, Courant Institute of mathematical Sciences, New York University, 1964.

Learning Outcomes

Upon successful completion of this course, the student will be able to: (Knowledge based)
distinguish among open and closed sets on different topological spaces;

- 1) know the two fundamental topologies: discrete and indiscrete topologies.
 - 2) Identify precisely when a collection of subsets of a given set equipped with a topology forms a topological space;
 - 3) Understand when two topological spaces are homeomorphic;
 - 4) Identify the concepts of distance between two sets; connectedness, denseness, compactness and separation axioms.
-
- 5) Research inquiry and analytical thinking abilities
-

Course Title
20212AEC42 Core XIII – Visual Programming

Objectives

Learn to design and develop Windows-based business applications using Visual Basic.NET programs that meet commercial programming standards.

- To learn the basic principles of visual programming
- To study the necessary skills to create software solutions using visual programming
- Understood the Open Data Base Connectivity using Visual programming.
- To inculcate knowledge on Programming and Project Development using Visual Basic.

UNIT I

Introduction to Visual Basic — Integrated Development Environment (IDE) features — VB Editor — Customizing the IDE — Anatomy of a form — Working with form properties — setting form's properties — Introducing form events and form methods.

UNIT II

Variables in Visual Basic: Declaring variables — Data types — Null value. Error value — Empty value - The scope of a variable Module level variables — Constants — Creating your own constants — Scope of a constant — Converting data types — Arrays — Declaring arrays — Fixed size arrays — Dynamic arrays — Preserve Keyword - ReDim — Writing code in Visual Basic — The anatomy of a procedure — Subroutine and functions — Language constructs — For Next, The While loop, Select case - End select, Exit statement. With structure.

UNIT III

Selecting and Using controls — Introduction to standard controls -- Command buttons - Text boxes — labels — Option buttons — Check boxes — Frame controls — List boxes — Combo boxes — Image objects — Picture boxes — Timer — Scroll bars - File system Controls (Drive, DirList, File List boxes)

UNIT IV

Introduction to Built — in ActiveX Control — Tool bar — The Tree view control — The List view control — The Image list control — Common Dialog Control — Status bar control Rich textbox control — Menu editor.

UNIT V

DDE Properties — DDE Methods — OLE properties — Active Control Creation and Usage and ActiveX DLL creation and usage - Database access — Data Control — field control — Data grid record set using SQL to manipulate data — Open Data Base Connectivity.

Reference:

1. Mohammed Azam, Programming with Visual Basic 6.0 — Vikas Publishing House Pvt, Ltd — 2002
2. Content Development Group, Visual Basic 6.0 — Tata McGraw Hill Publishing Company Limited — 2002.

Learning Outcomes

Upon completion of this course, the student will be able to:

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Implement syntax rules in Visual Basic programs.

- Write Windows applications using forms, controls, and events
 - Write and apply decision structures for determining different operations.
 - Write and apply loop structures to perform repetitive tasks.
 - Students are able to design a IDE enabled software solution to representative problems.
 - Students can use DDE data I/O components to read and write raster and vector data files.
 - Students can use OLE map components to develop a custom Windows Forms based application with a map and legend.
-

Course Title
20212AEC43 Number Theory

Objectives:

The objective is for the students to obtain a foundational knowledge of elements of Number Theory through step-by-step proofs of classical theorems, as well as to sharpen their skills through problem-solving.

UNIT I :

Fundamentals of Congruence's : Basic properties of Congruence's – Residue-Riffling. Solving Congruence's: Linear Congruence's-the theorems of Fermat and Wilson Revisited-the Chinese remainder Theorem-polynomial congruence's.

UNIT II :

Arithmetic functions: Combinatorial study of $\varphi(n)$ – Formulae for $d(n)$ and $\omega(n)\Omega(n)$. Multiplicative arithmetic functions. The Mobius inversion formula. Primitive roots: properties of reduced systems-primitive roots modulo P.

UNIT III :

Quadratic Residues: Euler's Criterion-the Legendre symbol-the quadratic Reciprocity law-Applications of the Quadratic reciprocity law, Distribution of quadratic residues: Consecutive residues and non residues-consecutive triples and Quadratic residues.

UNIT IV:

Sum of squares: Sums of two squares-Sums of four squares. Elementary partition theory; Introduction-graphical representation-Euler's partition theorem-searching for partition identities.

UNIT V :

Partition generating functions: Infinite products as generating functions-Identities between infinite series and products-partition identities: History and introduction-Euler's pentagonal number theorem-The Roger's Ramanujan identities-Series and Product identities.

TEXT BOOK: Scope and treatment as in "Number Theory" by George E. Andrews, Hindustan Publishing Corporation (India) Delhi-110 007 (1989).

- Unit I : Chapters IV and V
- Unit II : Chapters VI and VII
- Unit III : Chapters IX and X
- Unit IV : Chapters XI and XII
- Unit V : Chapters XIII and XIV

Learning Outcomes:

On satisfying the requirements of this course, students will have the knowledge and skills to:

1. Solve problems in elementary number theory
2. Apply elementary number theory to cryptography
3. Develop a deeper conceptual understanding of the theoretical basis of number theory and cryptography
4. Research inquiry and analytical thinking abilities

Course Title
20212DSC44A Elective –Combinatorial Mathematics

Objectives:

The main objective is to learn how rigorous mathematical tools can be made for the purpose of doing mathematics with help of computers.

UNIT I

Basic combinational numbers.

UNIT II

Generating functions and Recurrence relations symmetric functions.

UNIT III

Multinomials — Inclusion and exclusion principles — permutations with forbidden positions.

UNIT IV

Necklace problem and Burnside's Lemma — Cycle Index of a permutations group.

UNIT V

Polya's theorems and their immediate applications — Binary operations on permutations groups.

Reference

Combinatorics theory and applications by V. Krishnamurthy.

- Unit I : Chapter I (Pages 1 — 15)
- Unit II : Chapter I (Pages 26— 61)
- Unit III : Chapter I (Pages 66 — 98)
- Unit IV : Chapter 11 (Pages 99— 121)
- Unit V : Chapter II (Pages 122 — 159)

General Reference

Introductory Combinatorics — Kenneth P. Bogart — Pitman Publishing mc, MashJield, Mass achusetts.

Learning Outcomes

Upon successful completion of Math 315 - Combinatorics, a student will be able to:

- Apply diverse counting strategies to solve varied problems involving strings, combinations, distributions, and partitions,
- Write and analyze combinatorial, algebraic, inductive, and formal proofs of combinatoric identities,
- Recognize properties of graphs such as distinctive circuits or trees.

- will become familiar with fundamental combinatorial structures that naturally appear in various other fields of mathematics and computer science.
 - They will learn how to use these structures to represent mathematical and applied questions, and they will become comfortable with the combinatorial tools commonly used to analyze such structures.
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Course Title
20212DSC44B Elective- Design And Analysis of algorithms

Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNIT I INTRODUCTION

What is an algorithm? — Algorithm specification — Performance analysis — Randomized algorithms.

UNIT II ELEMENTARY DATA STRUCTURES

Stacks and Queues — Trees — Dictionaries — Priority Queues — Graph representations.

UNIT III DESIGN OF ALGORITHM METHODS

Divided — And — Conquer — General method — Binary search — finding the maximum and minimum in a set of items — Merge sort — Quick sort.

UNIT IV DESIGN OF ALGORITHM METHODS CONTINUATION

The Greedy method — The general method — Tree vertex Splitting Problem — Tree traversal and search techniques — Techniques for Binary trees — Techniques for Graphs — Breadth first search and depth first search traversal — Connected components and spanning trees — Backtracking — General method — the 8 — Queens Problem — Branch and Bound method — Travelling sales person algorithm.

UNIT V ALGEBRAIC PROBLEMS

Algebraic problems — The general method — Evaluation and Interpolation — The Fast Fourier transform — Modular arithmetic — Even faster evaluation and interpolation.

Reference

1. Eills Horowitz,. Sartaj Shani and Sanguthevar Rajasekaran — Fundamentals of Computer Algorithm — Galgotia Publications Pvt Ltd 2000.
Unit I Chapter 1 (sections; 1.1,1.2,1.3.1 to 1.3.4, 1.4.1 to 1.4.3)
Unit II Chapter 2 (section ; 2.1 to 2.4,2.6)
Unit III Chapter 3 (sections 3.1 to 3.5)
Unit IV Chapter 4 (sections 4.1, 4.3) Chapter 6 (sections 6.1 to 6.3)
Chapter 7 (sections 7.1, 7.2) Chapter 8 (sections 8.1, 8.3)
Unit V Chapter 9 (sections 9.1 to 9.5)

References

1. Aho A. V, Hopcroft, J.E. and Ullman, J.D.. The Design and Analysis of Computer Algorithms. Additor Wesley Reading Mass (1974)
2. Goodman, S. E and Hedetniemi, S.T Introduction to the design and analysis of algorithms (McGraw Hill international Edition 1987).

Learning Outcomes

Students who complete the course will have demonstrated the ability to do the following:

- 1) Argue the correctness of algorithms using inductive proofs and invariants.
- 2) Analyze worst-case running times of algorithms using asymptotic analysis.
- 3) Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyze them. Compare between different data structures. Pick an appropriate data structure for a design situation

Course Title
20211OEC Open Elective -Writing for the Media

Aim:

- To equip students to enter into the realm of mass media.

Objective:

- To comprehend the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media
- Learn to write for the media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop-Filters- Human interest stories- Recognizing and evaluation news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

ReferenceBook:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		
D.S Mehta	Mass Communication &Journalism		

Course Title
Open Elective – Applicable Mathematical Techniques

Objectives:

- 1) Understand the basic concept of Interpolation.
- 2) To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

1. For unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
2. For units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Learning outcomes

By the end of this course,

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

20213OEC OPEN ELECTIVE PAPER BIOMEDICAL INSTRUMENTATION
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Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

UNIT – I: BIO ELECTRIC SIGNALS AND ELECTRODES

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: RECORDING SYSTEM AND RECORDERS

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: MEASUREMENT AND ANALYSIS TECHNIQUES

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: MAGNETIC RESONANCE AND ULTRASONIC IMAGING SYSTEMS

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – medical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: ADVANCED BIO MEDICAL SYSTEMS

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

OUTCOMES:

- Define basic medical terms and physical values that can be handled by medical instrumentation,
- Describe methods and implementation of electrical and nonelectrical medical parameters diagnostic,
- demonstrate measuring of basic medical parameters,

- Calculate basic parameters of the equipment for using in electro diagnostic and electro therapy,
- Apply safety standards and select disposal method and procedures for electrical diagnostic equipment.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Title
20220OEC M-Marketing

OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

OUTCOMES

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge University Press, 2001.

Course Title
20214OEC Open Elective-Green Chemistry

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
 - To know about the Pollution and its prevention measures.
 - To familiarize the green chemistry.
 - To learn about the bio-catalytic reactions.
 - To understand about the vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Title
20215OEC Open Elective -Herbal Medicine

Aim:

- Be able to advise and educate effectively to create a comprehensive wellness plan incorporating herbal, dietary and lifestyle recommendations integrating self-awareness and lessons of nature

Objective

- Possess knowledge of traditional herbal systems as well as an understanding of the principles and practices of modern Western herbalism
- Demonstrate the ability to critically analyze herbal research and contribute to the current body of herbal literature
- Know how to integrate knowledge of raw materials, formulation, and herbal pharmacy for product development purposes
- Know how to effectively educate individuals and groups about herbs
- Be able to demonstrate basic skills in herb identification, harvesting, and preparation
- Be able to address potential safety concerns including herb-drug interactions

Outcomes

- Accurately gather information regarding past and current health status while differentiating between phenomena and the client's interpretation of phenomena
- Synthesize the above information to create a comprehensive assessment of health inputs and processes
- Work with clients to develop individualized goals and a plan for health and wellness

Unit I

Tribal medicine – methods of disease diagnosis and treatment – Plants in folk religion – *Aegle marmelos*, *Ficus benghalensis*, *Curcuma domestica*, *Cyanodon dactylon* and *Sesamum indicum*.

Unit II

Traditional knowledge and utility of some medicinal plants in Tamilnadu – *Solanum trilobatum*, *Cardiospermum halicacabum*, *Vitex negundo*, *Adathoda vasica*, *Azadirachta indica*, *Gloriosa superba*, *Eclipta alba*, *Aristolochia indica* and *Phyllanthus fraternus*.

Unit III

Plants in day today life – *Ocimum sanctum*, *Centella asiatica*, *Cassia auriculata*, *Aloe vera*. Nutritive and medicinal value of some fruits (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate) and vegetables - Greens (*Moringa*, *Solanum nigrum* Cabbage).

Unit IV

Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

Unit V

Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

References

1. Tribal medicine – D.C. Pal & S.K. Jain Naya Prakash, 206, Bidhan Sarani, Calcutta , 1998
2. Contribution to Indian ethnobotany – S.K. Jain, 3rd edition, Scientific publishers, B.No. 91, Jodhpur, India. 2001
3. A Manual of Ethnobotany – S.K.Jain, 2nd edition, 1995.
4. Kumar, N.C., An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi. 1993.
5. Rao, A.P. Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi, 1999

COURSE TITLE
20261OEC FINANCIAL SERVICES

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

- I. To gain knowledge on financial services.
- II. To understand importance of various services including banking, insurance, mutual funds.

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents-Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview:Definition-Characterstistics-Objectives-Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market:Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-Major Issues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

OUTCOME

- To introduces meaning and functions of Financial Intermediaries
- To understand the role of merchant bank and its services
- To provide information regarding management of mutual funds and Regulations
- To understand the role and functions of financial services Marketing
- To know the structure and types of debt Instruments
- To realize Foreign Exchange Market

REFERENCE BOOKS

1. Gordon ,Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

Course Title
20280OEC Open Elective - Counselling and Psychology

Aim:

- To acquaint with counselling and its process

Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Out Come:

- Learn counselling and its process

UNIT I

Definition of Counselling

Counselling as a Solution to Human Problems

Counselling-Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates

Social Determinates

UNIT III

Approaches to Counselling

Counselling Process

UNIT IV

Psychological Testing

Diagnosis

UNIT V

Educational Counselling

Family Counselling

References Book:

1. Hanson, J.C. Stevic, R.R., Warner, R.W., Jr. Counselling Theory & Process (2nd Edition) Boston
2. Hurlock Elizabeth B.(2007), Human Development, New York, Grawhill Book Company
3. John W, Santrock (1999), Life Span Development, 7th Edition, New Delhi; Mcgrowhill Company
4. blum And Bolimsky, B. Counselling & Psychology; Bomboy; Asia Publishing House, 1961
5. Bordin, E.S. Psychology Of Counselling New York; Application Century Crafts, 1968
6. Lewis E. C., The Psychology Of Counselling New York Holt, Rinchart And Winston Inc. 1970



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THANJAVUR – 613 403 - TAMILNADU

M.Phil

SYLLABUS

(REGULATION 2020)

**Department
of
Mathematics**

1.1.3	Colour
	Employability
	Skill Development



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DEPARTMENT OF MATHEMATICS

COURSE STRUCTURE

SEMESTER - I					
COURSE CODE	COURSE TITLE	L	T	P	C
203__ _ 11 (Common Paper)	Research Methodology	2	2	0	2
203MAC12	Algebra and Analysis	2	2	0	2
203MAC13	Advanced Numerical Analysis	2	2	0	2
(Common Paper) CPE_RPE	Research and Publication Ethics	2	2	0	2
	Total	08	08	00	08
SEMESTER - II					
203MAC31	Project Work				02

M Phil- SYLLABUS

(For the candidates admitted from the academic year 2020-2021 onwards)

PAPER – I Research Methodology

(Common for all Subjects except Languages)

Unit – I:

Methods and Technique. An introduction – Defining the research problem – What is a research problem?, Selecting the problem, Necessity of defining the problem, Technique involved in defining the problem, An illustration and conclusion. Research design – Meaning of research design, Need for research design, Features of good design, Important concepts of relating to research design, different research designs, Basic principles of experimental design and conclusion.

Unit – II:

Assignment and Thesis at the tertiary level: Writing at the tertiary level – assignments and term papers, thesis and dissertations, conventions of writing-the question of style. Planning the assignment – A time schedule, consulting source materials, preparing a work bibliography, taking notes, the outlines and the first draft. Planning the thesis – selecting a topic, reviewing the literature, designing the study and the chapter outline. Scholarly writing – a case study

Unit – III:

Writing the thesis or assignment: General format – preliminaries, the text, the reference material, the abstract and final product Page and Chapter format – chapter divisions and sub-divisions, spacing, pagination, margins, paragraph indentation and sample pages Tables and Figures – use of tables and figures, placement of tables and figures, Numbering of tables, numbering of pages, numbering of figures, table and figure captions, format of tables, format of figures, preparation of figures, foot notes to tables and figures, very large table and figures, pagination and margin, spacing and alignment, abbreviations and special symbols and numbers. Referencing – Reference systems, Essential informations, spacing capitalization and underline, alphabetical and chronological order, edited works and sum special cases.

Unit – IV:

Computer packages and Internet: Word Basics – Creating and working with documents – working with text and tables – Using Mail Merge. Using Excel: Working with worksheets – creating chart – working with Formula and Functions. Using Power Point: Working with power point – User Interfaces – Using templates and wizard (slide

Presentation) - - Creating chart and Tables. Internet and World Wide Web (WWW) – Electronic Main (E-mail) – Intranet and Extranet.

Unit – V:

Descriptive statistics – tabulation, graphical representation – bar diagram – and pie diagrams – various measures of variance, measures of central tendency and normal distribution. Differential statistics “t” test, Chi – square test, “F” test (ANOVA) co -variance (ANCOVA) correlation and multiple regression analysis - Introduction to SPSS.

References:

- Thesis and Assignment writing by Janarthan Anderson and others – Wiley – Eastern Ltd, 1970. Part I Sections 1,2,3,4. Part II Sections 5,6,9,10.
- Research Methodology by C.R. Kothari, Chapter 1,2,3.
- Microsoft Office 2003 – Edward C. Willet. First Edition 2004, Wiley Publications, USA , (Chapters 2,3,4,5,6,12,14,15,26,28,29)

Department of Mathematics
M.Phil Mathematics
Paper – II
203MAC12-ALGEBRA AND ANALYSIS

Course Outcomes:

1. To empower scholars with knowledge of pure mathematics.
2. To introduce the algebraic structure through modules.
3. To acquaint with advance concepts in algebra
4. To understand Borel measures.
5. To enhance problem solving skills in algebra.
6. To understand the techniques in algebra.

Unit-I: Modules

Modules homomorphism and exact sequence–Projective and injective–
Modules homomorphism and duality. (Chapter 4.1, 4.3, 4.4, Text Book-1)

Unit-II: Commutative Rings and Modules

Chain conditions – Prime and primary ideals – Primary decomposition –
Noetherian Rings and modules (Chapter 8.1, 8.2, 8.3, 8.4, Text Book – 1)

Unit III: Positive Borel Measures

Vector spaces – Topological preliminaries – Urysohn’s Lemma–The Riesz
representation theorem. (Chapter 2, Text Book -2, Sections 2.1-2.14).

Unit-IV: Problems in Algebra

Groups, subgroups, normal subgroups, quotient groups, homomorphisms,
cyclic groups, permutation groups, Cayley’s theorem, class equations, Sylow
theorems. Rings, ideals, prime and maximal ideals, quotient rings, Field
extensions, Galois theory. Algebra of matrices, rank and determinant of
matrices, linear equations. Eigenvalues and eigenvectors, Cayley-Hamilton
theorem. Matrix representation of linear transformations. Change of basis,
canonical forms, diagonal forms, triangular forms, Jordan forms

Unit V: Banach Algebras

Banach algebras – Spectrum of an element in Banach algebra – Spectral
radius formula – Quotient algebras–applications.
(Chapter 18, Text Book-2)

Books for Study:

1. Algebra by Thomas W Hungerford, Springer Verlag Indian reprint
2. Real and Complex Analysis by Walter Rudin, Tata McGraw Hill (II Edn) 1996.

Reference Books:

- Abstract Algebra by David.S.Dummit and Richard.M.Foote, 3rd Edition, Wiley Student Edition
2. Linear Algebra by Stephen H. Freidberg, Arnold J. Insel, Lawrence E.Spence, Fourth Edition, Pearson

Paper –III

M.Phil Mathematics

203MAC13-ADVANCED NUMERICAL ANALYSIS

Course Outcomes

1. Basic Knowledge of numerical methods
2. Approximation methods.
3. Linear and nonlinear approximation
4. Understanding polynomial equations
5. Techniques in numerical analysis
6. Initial and boundary value problems.

Unit-I: Transcendental and Polynomial Equations -Iteration method based on second degree equation – Rate of convergence –iterative methods – Methods for finding complex roots – iterative methods:-Birge-Vieta method, Bairtow's method, Gracffe's root squaring method.

Unit-II:System of Algebraic Linear Equations-Direct methods – Gauss Jotdan Elimination Method – Triangularization-method – Cholesky method – Partition method. Error Analysis – iteration methods : Jacobi iteration method – Gauss - seidal iteration method – SOR-method, Jacobi's method for symmetric matrices – power method – Inverse-power method.

Unit-III: Interpolation and Approximation-Hermite interpolation – Piecewise and spline interpolation –Approximation– Least square Approximation.

Unit-IV: Differentiation And Integration-Numerical differentiation – Numerical Integration – Methods based on interpolation.

Unit-V: Ordinary Differential Equations-Multi – step method – predictor – Corrector method – Boundary value-problem – initial value methods – shooting method – Finite Difference method.

Text Book

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for scientific and Engineering Computation, III Edn, Wiley Eastern Ltd., 1993.

Unit I - Chapter 2 – 2.4 to 2.8

Unit II - Chapter 3 – 3.2 to 3.5

Unit III - Chapter 4 – 4.4 – 4.6, 4.8 to 4.9

Unit IV - Chapter 2 – 2.4 to 2.8

Unit V - Chapter 6 – 6.4, 6.5, 6.8, 6.9, 6.10

References:

1. Kendall E. Atkinson, An introduction to Numerical Analysis, II Edn., John Wiley & Sons, 1988.
2. M.K. Jain, Numerical Solution of Differential Equations, II Edn., New Age International Pvt. Ltd., 1983.
3. Samuel. D. Conte, Carl, De boor, Elementary Numerical Analysis,Mc Graw-Hill International Edn.,1983.

RESEARCH AND PUBLICATION ETHICS

Course Code	Course Title	L	T	P	C
CPE_RPE	Research and publication ethics				2

THEORY

Unit I: PHILOSOPHY AND ETHICS (3 hours)

1. Introduction to philosophy, definition, nature and scope, concept, branches.
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

Unit II: SCIENTIFIC CONDUCT (5 hours)

1. Ethics with respect to science and research.
2. Intellectual honesty and research integrity.
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing.
5. Selective reporting and misrepresentation of data.

Unit III : PUBLICATION ETHICS (7 hours)

1. Publication ethics: definition, introduction and importance.
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest.
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types.
5. Violation of publication ethics, authorship and contributorship.
6. Identification of publication misconduct, complaints and appeals.
7. Predatory publishers and journals.

PRACTICE

Unit IV: OPEN ACCESS PUBLISHING (4 hours.)

1. Open access publications and initiatives.
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU.
4. Journal finder / journal suggestion tools viz, JANE, Elsevier Journal Folder, Springer Journal Suggester, etc.

UNIT V : PUBLICATION MISCONDUCT (4 hours)

A. Group Discussions (2 hours)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest.
3. Complaints and appeals: examples and fraud from India and abroad.

B. Software tools (2 hours)

Use of plagiarism software like Turnitin, Urkund and other open source software tools.

UNIT VI: DATABASES AND RESEARCH METRICS (7 hours)

A. Databases (4 hours)

1. Indexing databases.
2. Citation database: Web of Science, Scopus etc.

B. Research Metrics (3 hours)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score.
Metrics: h-index, g index, i10 index, altmetrics.

COMPUTER SCIENCE

1.1.3	Colour
EMPLOYABILITY	Yellow
SKILL DEVELOPMENT	Green
ENTREPRENEURSHIP	Cyan
EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT	Pink



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
B.Sc., COMPUTER SCIENCE- REGULATION 2020

B.Sc C.S. Graduate Attributes :

- Information Literacy
- Problem Analysis
- Design/development of solutions
- Modern tool usage
- Professional and Ethical understanding

B.Sc C.S. Programme Objectives-PEO

- POE1- To study about I/O management, storage management
- POE2- To know the methods of connecting them to the peripheral devices.
- POE3- To learn Software design and Implementation
- POE4- To learn the basic principles of database and database design
- POE5- To understand computational development of graphics with mathematics

B.Sc C.S. Programme Outcomes -PO

- PO1- Understand dynamic memory allocation and pointers.
- PO2- Trace the flow of information from one node to another node in the network.
- PO3- Understand the format and use of objects.
- PO4- Able to Measure the product and process performance using various metrics
- PO5- Design Secure applications.
- PO6- Apply the various optimization techniques.

B.Sc C.S. Courses -C

- C1-** Programming in C with C++
- C2-** Internet and Java Programming
- C3-** Visual Programming
- C4-** Active Server Programming
- C5-** E-Business Technology
- C6-** Operating System
- C7-** Microprocessor and its Applications
- C8-** .NET Programming
- C9-** Relational Data Base Management System

B.Sc C.S. Curriculum Mapping

Programme Educational Objectives-PEO vs Programme Outcome-PO

Programme Outcome-PO Programme Educational Objectives-PEO	PO1	PO2	PO3	PO4	PO5	PO6
PEO1		✓			✓	
PEO2	✓					
PEO3			✓			✓
PEO4				•		✓
PEO5			✓		✓	

B.Sc C.S. Curriculum Mapping

Programme Outcome-PO VS Course Outcome-CO

Programme Outcome-PO Course Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓					
CO2	✓		✓			
CO3	✓		✓		✓	
CO4			✓			✓
CO5		✓				
CO6				✓		✓
CO7						✓
CO8			✓			✓
CO9					✓	✓

DEPARTMENT OF COMPUTER SCIENCE
B.Sc., COMPUTER SCIENCE- REGULATION 2020

COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tamil – I/ Advanced English-I /Hindi-I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20120SEC13	Programming in C with C++	5	1	0	4
20112AEC14B	Classical algebra	4	1	0	3
20112AEC15B	Numerical and statistical Methods	4	1	0	4
PRACTICAL					
20120SEC16L	Programming in C with C++ Lab	0	0	3	2
	Total	21	3	3	17
AUDIT COURSE					
221LSCIC	Indian Constitution	-	-	-	2
221LSCUV	Universal Human Values	-	-	-	2

SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil – II/ Advanced English-II /Hindi-II	4	0	0	2
20111AEC22	English-II	4	0	0	2
20120SEC23	Internet and Java Programming	5	1	0	4
20112AEC24B	Discrete Mathematics	4	1	0	4
20112AEC25B	Operations Research	4	1	0	3
PRACTICAL					
20120SEC26L	Internet and Java Programming Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20120RLC27	Research Led Seminar	-	-	-	1
	Total	21	3	3	18
AUDIT COURSES					
201LSCCS	Communication Skills	-	-	-	2
201SSCBE	Basic Behavioral Etiquette	-	-	-	2

SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil – III/Hindi-III/ <u>Advanced English-III</u>	4	0	0	2
20111AEC32	English-III	4	0	0	2
20120SEC33	Visual Programming	4	1	0	4
20113AEC34A	Applied Physics –I	4	1	0	5
PRACTICAL					
20120SEC35L	Visual Programming Lab	0	0	3	2
20113AEC36AL	Applied physics Lab – I	0	0	3	2
RESEARCH SKILL BASED COURSE					
20120RMC37	Research Methodology	2	0	0	2
	Total	18	2	6	19
AUDIT COURSE					
201LSOAN	Office Automation	-	-	-	2

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 19135AEC41	Tamil-IV/ Advanced English-IV /Hindi-IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20120SEC43	Active Server Programming	4	1	0	4
20113AEC44A	Applied Physics –II	5	1	0	5
201ENSTU45	Environmental Studies	2	0	0	2
PRACTICAL					
20120SEC46L	Active Server Programming Lab	0	0	3	2
20113AEC47AL	Applied Physics Lab –II	0	0	3	2
	Total	19	2	6	19
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability				2

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
20120SEC51	Data Communication and Networking	4	1	0	4
20120SEC52	Operating System	4	1	0	3
20120SEC53	Microprocessor and its Applications	4	1	0	4
20120DSC54_	Discipline Specific Elective -I	4	1	0	3
PRACTICAL					
20120SEC55L	Microprocessor Lab	0	0	3	2
20120SEC56L	Operating System Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20120BRC57	Participation in Bounded Research	-	-	-	1
	Total	16	4	6	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2

SEMESTER – VI

Course Code	Course Title	L	T	P	C
THEORY					
20120SEC61	.NET Programming	4	1	0	4
20120SEC62	Relational Data Base Management System	4	1	0	5
20120DSC63_	Discipline Specific Elective –II	4	1	0	3
201_ _OEC(2 Digit Course Name)	Open Elective	4	0	0	2
PRACTICAL					
20120SEC64L	.NET Programming Lab	0	0	3	2
20120SEC65L	Oracle Lab	0	0	3	2

20120PRW66	Project Work	-	-	-	4
20120PROEE	Program Exit Examination	-	-	-	1
	Total	16	3	6	23
AUDIT COURSE					
201SSCIM	Interview Skills Training and Mock Test	-	-	-	2
201LSCCE	Community Engagement	-	-	-	1
Total Credits –Programme					115
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
V	a)20120DSC56A- Cloud Computing b)20120DSC56B- Middleware Technology c)20120DSC56C- Enterprise Resource Planning
VI	a) 20120DSC65A- Data Mining b) 20120DSC65B- Artificial Intelligence and Expert System c)20120DSC65C- Ethical Hacking

Open Electives

Semester	Open Elective Courses
VI	a) 201TAOEC-Tamil IlakkiyaVaralaru b) 201MAOEC- Development of Mathematical Skills c) 201PHOEC- Instrumentation d) 201CHOEC- Food and Adulteration e) 201MBOEC- Wildlife Conservation f) 201CSOEC- Web Technology g) 201CMOEC- Banking Service

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

முதல் பருவம் - தாள் - I

இக்கால இலக்கியம், செய்யுள், சிறுகதை, இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி
அலகு - I

பாரதியார் தேசபக்திப் பாடல்கள்

சுதந்திரப் பெருமை

சுதந்திரப் பயிர்

சுதந்திர தேவியின் துதி

தொண்டு செய்யும் அடிமை

பாரதிதாசன்

வீரத்தாய்

அலகு - II

சுரதா - நல்ல தீர்ப்பு

கண்ணதாசன் - கந்தல் துணியின் கதை

பட்டுக்கோட்டை கல்யாணசுந்தரம் - நண்டு செய்த தொண்டு - காலம் சரியில்லை

முடிமத்தா - வாழையடி வாழை

வாலி - தாய்

அலகு - III

சிறுகதை - இளவேனிற் குறிப்புகள் - திருவையாறு பாலகுமார்

அலகு - IV

இலக்கணம்

எழுத்து

மனப்பாடப்பகுதி

அலகு - V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதைபுதுக்கவிதை

தாள் - I

ஒப்படைவு - மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை - 20 மதிப்பெண்

ஆத்திச்சூடி - 20 மதிப்பெண்

அறம் செய விரும்பு, ஆறுவது சினம், இயல்வது கரவேல், ஈவது விலக்கேல், உடையது விளம்பீல், ஊக்கமது கைவிடீல், எண் எழுத்து இகழீல், ஏற்பது இகழ்ச்சி, ஐயம் இட்டு உண், ஒப்புரவு ஒழுத, ஒதுவது ஒழியேல், ஓளவியம் பேசேல், கண்டு ஒன்று சொல்லேல், ஞாயம்பட உரை, இடம்பட வீடு எடீல், இணக்கம் அறிந்து இணங்கு, தந்தை தாய்ப்பென்றன்றி மறவேல், பருவத்தீத பயிர்செய், இயல்பு அலாதன செயேல், வஞ்சகம் பேசேல், இளமையில் கல், அனந்தல் ஆடீல், கடிவது மற, கீழமை

அகற்று, குணமது கைவிடீல், கெடுப்பது ஒழி, கேள்வி முயல், சான்றோர் இனத்து இரு, சோம்பித்திரியேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை, கட்டுரை, நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

SKILL DEVELOPMENT

References:

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Essentials of Business Communication	-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons
English for writers and translators	-Robin Macpherson
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
The World's Great Speeches	- Sudhir Kumar Sharma Galaxy Publishers
English Work Book-I&II	-Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

AIM:

- To acquaint students with learning English through literature

OBJECTIVE:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

UNIT –I

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT – II

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –III

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT –IV

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –V

Oliver Twist -Charles Dickens

EMPLOYABILITY

OUTCOME:

- Read and comprehend literature

REFERENCES:-

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan

Emerald Publishers

Course Code	Course Title	L	T	P	C
20120SEC13	Programming in C with C++	5	1	0	4

AIM

To equip the students with fundamental programming principles and concepts of object oriented design.

OBJECTIVES:

The students should be made to:

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.
- To learn how C++ supports Object Oriented principles such as abstraction, polymorphism etc
- To understand and apply the principles hiding, localization and modularity in software
- Design and implement reliable and maintainable object-oriented applications of moderate complexity composed of several classes

UNIT -I

Introduction - Basic Structure of C Programs - Character set -C Tokens - Constants - Variables-Data Types - Declaration and Assigning Values to Variables - Defining Symbolic Constants - Operators - Expressions - Type conversions - Built-in functions.

UNIT -II

Managing Input and Output Operators - Decision Making and Branching - Decision Making and Looping – Arrays and its Types.

UNIT –III

Functions: The Form of C Functions-Return Values and Their Types -Calling a Function- Category of Functions- Nesting of Functions-Recursion- Structures and Unions-Pointers.

UNIT-IV

Basic concepts of OOPs- Benefits and Application of OOPs- Inline functions- Function overloading – Friend and Virtual Functions -Constructors and Destructors - Operator overloading.

UNIT-V

Inheritance and its Types- Files - Classes for file stream operations - Opening, Closing and processing files - End of file Detection - File Pointers - Updating a file - Error handling during file operations - Command Line Arguments - Templates - Exception Handling.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications
- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to demonstrate the use of virtual functions to implement polymorphism.
- Understand functions and parameter passing.
- Be able to do numeric (algebraic) and string-based computation.
- Understand object-oriented design and programming

REFERENCE BOOKS:

1. "Programming in C" – E. Balagurusamy – Tata McGraw-Hill Publications
2. "Programming with C" – Byron S.Gottfried – Schaum's outline series – Tata McGraw-Hill publications.
3. "Object oriented programming with C++". E. Balagurusamy, Tata McGraw Hill Publishing ltd., New Delhi, 1995.
4. "C++ The complete reference"- Herbert Schildt, 3rd edition, Tata McGraw Hill Pub-Ltd., 1999

Course code	Course Title	L	T	P	C
20112AEC14B	Classical Algebra	4	1	0	3

OBJECTIVES

To learn about the expansion of a Binomial Theorem for a rational index using vandermonde's theorem. Further we aim at learning problems to be solved using the different types in Binomial series .Understanding the relation between roots and coefficients of polynomial equations-symmetric functions-sum of r^{th} power of the roots-two methods And Reciprocal equations-Descartes' rule of signs-simple problems.

UNIT-I

Binomial, exponential and logarithmic series (formulae only)- Summations.

UNIT-II

Non singular, symmetric, skew symmetric orthogonal, Hermitian, skew Hermitian and unitary matrices-characteristic equation, Eigen values, Eigen vector-Cayley Hamilton's theorem(proof not needed)-simple applications.

UNIT-III

Relation between roots and coefficients of polynomial equations-symmetric functions-sum of r^{th} power of the roots-two methods.

UNIT-IV

Transformation of equations-diminishing, increasing and multiplying the roots by a constant-forming equation with the given roots.

UNIT-V

Reciprocal equations-Descartes' rule of signs-simple problems.

Learning outcomes EMPLOYABILITY

By the end of this course, you should:

- Understand the theory of, and be able to solve problems in Cayley Hamilton Theorem, and finding the Eigen values & Eigen vectors
- be able to manipulate relation between root and coefficients, symmetric functions of the roots in terms of the coefficients and transformation of equation .
- be able to calculate summation related to Binomial, Exponential and Logarithmic series

REFERENCE BOOKS:

Algebra-T.K.M.Pillai, Vol1&2.

Course code	Course Title	L	T	P	C
20112AEC15B	Numerical And Statistical Methods	4	1	0	4

OBJECTIVES:

The roll of numerical analysis is to develop and analyze the numerical techniques. In this paper, different methods for finding the roots of algebraic and transcendental equations, solutions of simultaneous equations, solutions of ordinary differential equations Solution of Linear systems ,Numerical differentiation and integration interpolation with equql & unequal intervals are concentrated. Correlation coefficient and its properties Linear Regression and its properties, Test of significance would also be taught.

UNIT-I

Algebraic and transcendental equations-the iteration method –the Newton Raphson method-False Position method-the bisection method

UNIT-II

Interpolation-Finite difference –Newton’s formulae for interpolation-Lagrange’s formulae for interpolation-Gaussian elimination method –Gauss-Seidal method.

UNIT-III

Numerical different ion and integration-Maximum and minimum values of a tabulated functions-Trapezoidal rule-Simpson’s rule –Numerical solution of ordinary differential equations-Euler’s method –Runge Kutta methods-Predictor corrector method-Boundary value problems.

UNIT-IV

Correlation –different types of correlation –Karl Pearson’s spearman’s correlation-Regression-Regression coefficients-Regression equations-Properties of correlation and regression coefficients.

UNIT-V

Test of hypothesis-null and alternative hypothesis-tests of significance based on normal and distribution for mean, simple correlation and proportion Chi square test-independents of attributes and goodness of fit-applications.

EMPLOYABILITY

REFERENCE BOOKS:

1. Introductory methods of numerical analysis S.S.Sastry, PHI
2. Fundamentals of mathematical statistics-S.C.Gupta & V.K.Kapoor.

Learning outcomes

By the end of this course, you should:

- be able to calculate the solution of algebraic and transcendental equations, Solutions of simultaneous equations,
- be able to calculate the area of the given curve

Course Code	Course Title	L	T	P	C
20120SEC16L	Programming in C with C++ Lab	0	0	3	2

1. Solution of a Quadratic Equation (all cases).
2. Sum of Series (Sine, Cosine, e^x)
3. Ascending and descending order of number using Arrays (Use it to find largest and smallest numbers).
4. Sorting of names in Alphabetical order.
5. Write a c program for Matrix Operations (Addition, Subtraction, Multiplication- use functions).
6. Write C++ program using a class to represent a bank account with data members- name of depositor, account number, type of account, balance and member functions - deposit amount, withdraw amount, show Name and balance. Check the program with your own data.
7. Write C++ programs for implementing inheritance.
8. Write a C++ program using friend function.
9. Write a C++ program which reads a text from a file and the display the following information (Number of Lines, Number of words, and Number of characters).
10. File Processing: Mark sheet preparation.

Course Outcomes:

- *Read understand and trace the execution of programs written in C language.
- *Write the C code for a given algorithm.
- *Implement programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- *Write programs that perform operations using derived data types.
- *Be able to do numeric (algebraic) and string-based computation.
- *Illustrate flowchart and algorithm to the given problem.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

OBJECTIVES:

- To make the students understand about the Democratic Rule and Parliamentary administration.
- To appreciate the salient features of the Indian Constitution.
- To know the fundamental Rights and Constitutional Remedies.
- To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
- To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

UNIT I:

The Making of Indian Constitution

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II:

Fundamental Rights and Fundamental Duties of the Citizens

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties .

UNIT III:

Directive Principles of State Policy

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV:

The Union Executive, Union parliament and Supreme Court

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister Rajya Sabha- Lok Sabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

UNIT V:

State Council – Election System and Parliamentary Democracy in India

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

EMPLOYABILITY

OUTCOMES

- Democratic values and citizenship Training are gained.
- Awareness on Fundamental Rights are established.
- The functions of union Government and State Governments are learnt.
- The power and functions of the Judiciary learnt thoroughly.
- Appreciation of Democratic parliamentary Rule is learnt.

REFERENCE BOOKS:

1. Palekar S.A. Indian Constitution Government and polities, ABD Publications, India.
2. Aiyer Alladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. Kashyap Subash C Our Parliament, National Book, Trust New Delhi 1989.

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn/gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will

learners lose if they don't practice it?

- Learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit III

• Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence

- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence

• Narratives and anecdotes about non-violence from history, and literature including local folklore

• Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?

- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Casestudies

Unit IV

• Introduction: What is righteousness?

- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness?

What will learners lose if they don't practice it?

- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit V

• Introduction: What is peace? Its need, relation with harmony and balance

- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore

• Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?

- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Casestudies

Unit VI

• Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.

- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature

including local folklore

- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Casestudies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and Ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

தாள் - II

செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறுமனப்பாடப்பகுதி
அலகு-I

திருஞானசம்பந்தர் தேவாரம் -இடரினும் தளரினும் - பதிகம்

திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை - பதிகம்

திருவாசகம் - கோயிற் திருப்பதிகம்

திருமந்திரம் - 25, 85, 139,238,250,252,270,724,2104,2716

திருஅருட்பா - தெய்வமணி மாலை 1,8,9

அலகு-II

நம்மாழ்வார் - 1 பாசரம்- திருவாய்மொழி -எம்பெருமானுக்கு ஆட்படுதல் இன்பமே

பெரியாழ்வார் - 1 பாசரம் - திருப்பல்லாண்டு - தாலப்பருவம்

நாச்சியார் திருமொழி -10 பாடல்கள்- ஆறாம் திருமொழி

அலகு-III

சிற்றிலக்கியம் , முக்கூடற்பள்ளு- வளமை, செழுமை

மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ்- தாலப்பருவம்-ஐந்துபாடல்கள்

அலகு-IV

இலக்கணம்

சொல்

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

சைவ, வைணவ இலக்கியங்கள்

சிற்றிலக்கியம்பள்ளு

பிள்ளைத்தமிழ்

பரணி

தாள் II

ஒப்படைவு - மதிப்பெண் 40 பாடத்தொட்புடைய கட்டுரை 20 மதிப்பெண் கொன்றை வேந்தன்
20 மதிப்பெண்

அன்னையும் பிதாவும் முன்னறி தெய்வம், இல்லறம் அல்லது நல்லறம் அன்று, ஊருடன் பகைக்கின் வேருடன் கெடும்,ஏவா மக்கள் மூவா மருந்து,ஒளவியம் பேசுதல் ஆக்கத்திற்கு அழிவு, அட்கமும் காசும் சிக்கனத்தோடு,கற்பெனப்படுவது சொல்திறம்பாமை,கிட்டாதாயின் வெட்டென மற,கீழோர் ஆயினும் தாழ உரை,குற்றம் பார்க்கின் சுற்றம் இல்லை, கூர் அம்பு ஆயினும் வீரீயம் பேசேல், கெடுவது செய்யின் விடுவது கருமம், கைப்பொருள் தன்னின்,மெய்ப்பொருள் கல்வி,சீரைத்தேடின ஏரைத்தேடு, சுற்றத்திற்கு அழகு சூழ இருத்தல்,சூதும் வாதும் வேதனை செய்யும்,சேமம்புகினும் யாமத்து உறங்கு, சோம்பர் என்பவர் தேம்பித்திரிவர், தந்தை சொல்மிக்க மந்திரம் இல்லை, தாயிற் சிறந்தது ஒரு கோவிலும் இல்லை, திரைகடல் ஓடியும் திரவியம் தேடு, தீராக் கோபம் போராய் முடியும், தோழனோடும் ஏழமை பேசேல்,நாடெங்கும் வாழக் கேடொன்றும் இல்லை,நீரகம் பொருந்திய ஊரகத்து இரு, பாலோடு ஆயினும் காலம் அறிந்து உண், பையச் சென்றால் வையம் தாங்கும், மருந்தே ஆயினும் விருந்தோடு உண், முற்பகல் செய்யின் பிற்பகல் விளையும், மேழிச் செல்வம் கோழைபடாது,(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

Aim:

- To improve the knowledge of English

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

- **Objective:**

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT –I

E-mail, Fax, Memos

UNIT – II

Itinerary, Checklist

UNIT – III

Invitation, Circular

UNIT – IV

Instruction, Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

References:

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Inspiring Lives	-Maruthi Publishers
English Work Book-I&II	-Jewelcy Jawahar

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

AIM:

- To acquaint learners with different trends of writing

OBJECTIVE:

- To empower students to acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

UNIT – I

Ecology -A.K. Ramanujan

Gift -Alice Walker

The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans

Asleep -Ernst Jandl

Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas

I Have a Dream -Martin Luther king

Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe

The Fortune Teller -Karel Capek

Proposal -Anton Chekov

OUTCOME: SKILL DEVELOPMENT

- Read and comprehend literature

REFERENCES:-

Gathered Wisdom -GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
20120SEC23	Internet and Java Programming	5	1	0	4

AIM

To equip the students with basic programming skill in Java

OBJECTIVE

- To understand the core principles of the Java Language
- To study about Graphics programming using java Language
- To learn visual tools to produce well designed, effective applications and applets.

UNIT-I

Introduction to the Internet - Internet Technologies - Internet Browsers

UNIT-II

Decision making and looping statements -Classes, Objects and Methods

UNIT-III

Arrays, strings and vectors- Interfaces: Multiple Inheritance – Packages: Putting classes together - Multithreaded Programming.

UNIT-IV

Managing Errors and Exceptions - Applet programming- Graphics programming

UNIT-V

Managing Input/Output files in Java

OUTCOMES:

- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

REFERENCE BOOKS:

1. “World Wide Web Design with HTML”, C.Xavier, Tata McGraw-Hill Publishing Company Limited for Unit-1.
2. “Programming with Java”, E.Balagurusamy, Tata McGraw-Hill Publishing Company Limited for Unit-2, 3, 4, 5.

EMPLOYABILITY

Course code	Course Title	L	T	P	C
20112AEC24B	Discrete Mathematics	4	1	0	4

OBJECTIVES:

Algebraic structures like Groups ,cosets , different types of morphisms of groups fundamental thm of homomorphism are concentrated. Graph Theory is an integral part of Discrete Mathematics. It has applications to many fields, including computer science, physics, chemistry, psychology and sociology. In this course we teach basic topics in graph theory 20 such as Trees, Directed graphs, Connectivity, Euler tours are also concentrated

UNIT I

Groups- Types – Properties Of Groups- Semi Groups-Monoids – Problem In Groups- Cyclic Groups And Subgroups

UNIT-II

cosets & lagrange's thm-Normal groups and quotient groups- Different types of morphisms of groups fundamental thm of homomorphism.

UNIT III

Graph theory - Basic concepts- Finite and infinite graph – Incidence and degree ideas on vertices- Isomorphism-sub graphs – Walks – Paths and circuits.

UNIT IV

Connected Graphs And Disconnected Graphs And Components - Euler Graphs – Hamiltonian Path And Circuits

UNIT V

Trees-properties of trees -pendent vertices – Distance and centers in a tree rooted and binary trees.

REFERENCE BOOKS

1. **Algebra - Arumugan Issac**
2. **Graph theory – Narasingh deo**

Learning outcomes

By the end of this course, you should be able

- Understood the concept of Algebraic structures like Groups ,cosets , different types of morphisms of groups fundamental theorem of homomorphism
- Knowledge in Graph Theory
- Understood the properties of Graph Theory
- Understood the concept of Euler theorem and its applications

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20112AEC25B	Operations Research	4	1	0	3

OBJECTIVES:

Optimization is an important tool of modern applied mathematics. This course gives an idea to the student to recognize potential linear programming problems, to formulate such problems as linear programming models, to employ the proper computational techniques to solve these problems, and to understand the mathematical aspects that tie together these elements of linear programming. The objective of this paper is to highlight the theoretical, computational and applied aspects of linear programming problems.

UNIT — I

Basic of operations research (OR) characteristics of OR - Necessity of OR in industry, OR and decision making - role of computers in OR Linear Programming: Formulations and graphical solution of (2 variable) canonical and standard forms of linear programming problem.

UNIT — II

Algebraic Solution: Simplex methods — Charnes method of penalty - Two phase simplex method.

UNIT — III

Transportation Model: Definition — Formulation and solution of transportation models the row — Minima, column minima, Matrix minima and Vogel's approximation method.

Assignment Model: Definition of assignment model— comparison with transportation model - Formulation and solution of assignment model

UNIT — IV

Sequencing problem: Processing of n jobs through 2 machines - processing n jobs through 3 machines - processing 2 jobs through m machine Games Theory: Characteristics of games — Maximin, Minmax, criteria of optimality — Dominance property - Algebraic and graphical method of solution of solving 2 x 2 games.

UNIT — V

PERT computation — Resource scheduling.

EMPLOYABILITY

REFERENCES BOOK

1. Hamdy A. Taha: Operation Research - An Introduction 5th Edition, PHI, New Delhi 1996
2. Ackoff, R Land Sasieni, M.N: Fundamental of Operation research, John Wiley and sons, New york 1968.

Learning outcomes

By the end of this course,

- Students using OR techniques in business tools for decision making
- Students develop PERT and CPM networks and finding the shortest path
- Understand the concept of sequencing problems and game theory

Course Code	Course Title	L	T	P	C
20120SEC26L	Internet and Java Programming Lab	0	0	3	2

1. Simple programming using for, while, do-while, ternary and switch.

2. String handling using string and string buffer. Inheritance.

3. Polymorphism

4. Interfaces and Packages

5. Data files (creation, processing)

6. Vector manipulation

7. Simple programs using Applets

8. Exercises using predefined and user defined exceptions

9. Graphics programs for drawing lines, rectangle, oval, string using Applets.

Course Outcome:

*To solve computational problems using basic constructs like if-else, control structures, array and strings.

*To implement relationships between classes and Usage in Data Structures.

*To evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.

*To develop software applications using Java programming language.

*Write modular, multithreading and event driven programming.

*Implement interfaces, inheritance, polymorphism, exception handling, file IO and multithreading as programming techniques for application development.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Aim:

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text
 - ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says

- ii. To understand what a text does
- iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. Powerpoint

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Digital Marketing

Unit VII

- Meaning of non-verbal communication

- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhuchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

தாள் - III

செய்யுள் - காப்பியங்கள், இலக்கணம்,இலக்கிய வரலாறு, மனப்பாடப்பகுதி

அலகு-I

சீலப்பதிகாரம்-வழக்குரை காதை மணிமேகலை-ஆதிரை பிச்சையிட்ட காதை
சீவகசிந்தாமணி-நாட்டுவளம் 10 பாடல்கள்

அலகு-II

பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம். கம்பராமாயணம்-வாலி வதைப்படலம்

அலகு-III

சீறப்பராணம் - கரம் பொருத்து படலம். இயேசுகாவியம் - மழைப்பொழிவு

அலகு-IV

இலக்கணம்

யாப்பு

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

காப்பியங்கள்

ஐஞ்சீறுகாப்பியங்கள்

புராணங்கள், இதிகாசங்கள்

தாள் - III

ஒப்படைவு - மதிப்பெண் 40

பாடத்தொடர்புடையக் கட்டுரை 20 மதிப்பெண்

வெற்றி வேற்கை 20 மதிப்பெண்

எழுத்து அறிவித்தவன் இறைவன் ஆகும், கவ்விக்கு அழகு கசடற மொழிதல், செல்வர்க்கு அழகு செழுங்கிளை தாங்குதல், மன்னவர்க்கு அழகு செங்கோல் முறைமை, வைசியர்க்கு அழகு வளர் பொருள் ஈட்டல், உழவர்க்கு அழகு உழுது ஊண் விரும்பல், மந்திரிக்கு அழகு வரும் பொருள் உரைத்தல், தந்திரிக்கு அழகு தறுகண் ஆண்மை, உண்டிக்கு அழகு விருந்தோடு உண்டல், பெண்டிர்க்கு அழகு எதிர் பேசாதிருத்தல், அறிஞர்க்கு அழகு கற்றுணர்ந்து அடங்கல், வறிஞர்க்கு அழகு வறுமையில் செம்மை, பெரியோர் எல்லாம் பெரியோரும் அல்லர், சிறியோர் எல்லாம் சிறியரும் அல்லர், அடினும் ஆவின் பால் தன் சுவை குன்றாது, சுடினும் செம்பொன் தன்னொளி கெடாது, அறைக்கினும் சந்தனம் தன் மனம் மாறாது பெருமையும் சிறுமையும் தான் தர வருமே, அறிவுடை ஒருவனை அரசும் விரும்பு, யானைக்கு இல்லை தானமும், தருமமும், பூனைக்கு இல்லை தவமும் தயையும், ஞானிக்கு இல்லை இன்பமும் துன்பமும் , அச்சமும் நாணமும் அறிவிலோருக்கு இல்லை, நாளும் கிழமையும் நலிந்தோருக்கு இல்லை, கேளும் கிளையும் கெட்டோருக்கு இல்லை, உடைமையும் வறுமையும் ஒரு வழி நிலலா, இரந்தோர்க்கு ஈவதும் உடையோர் கடனே, பழியா வருவது மொழியாது ஒழிவது, சுழியா வருபுனல் இழியாது ஒழிவது, துணையோடு அல்லது நெடுவழி போகேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை, கட்டுரை, நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech, Classification of speech sounds , Vowels and Diphthongs

UNIT –II

Consonants, Consonant cluster

UNIT – III

Syllable, Word accent, Intonation

UNIT – IV

Idiom, Interpretation of graphics

UNIT – V

Slogan writing, Writing advertisement

References:

English Grammar -Wren and Martin
 English Grammar and Composition -Radhakrishna Pillai
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma
 A text book of Phonetics for Indian Students -T.B. Balasubramaniyan

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

AIM:

- To acquaint students with learning English through literature

OBJECTIVE:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

OUTCOME:

- Read and comprehend literature

UNIT – 1

The Doctor’s World	- R.K. Narayan
The Postmaster	- Rabindranath Tagore
Princess September	- E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	- Norah Burke
Uneasy Home Coming	- Will F. Jenkins
Resignation	- Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

REFERENCES:-

Nine Short Stories	-Steuart H.King Blackie Books
One-Act plays of Today	-T.Prabhakar Emerald Publishers

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC33	Visual Programming	4	1	0	4

AIM:

To equip the students with principles of various visual programming environment

OBJECTIVE:

- To learn the basic principles of visual programming
- To study the necessary skills to create software solutions using visual programming
- Understood the Open Data Base Connectivity using Visual programming.
- To inculcate knowledge on Programming and Project Development using Visual Basic.

UNIT I

Visual Basic – Integrated Development Environment (IDE) features – VB editor – customizing the IDE – anatomy of a form working with form properties – setting form’s properties – introducing form events and form methods.

UNIT II

Variables in Visual Basic : Declaring variables – Data types – Null values, Error value – empty value – the scope of a variable – Module level variable – Constants – Creating your own constants – Scope of a constant – Converting data types – arrays – Declaring arrays – Fixed size arrays – Dynamic arrays – Preserve keywords – ReDim. Writing code in Visual Basic – The anatomy of a procedure – Subroutine and Functions – Language constructs – For...Next, The While loop, Select case...End select, Exit statement, with structure.

UNIT III

Selecting and Using controls – Introduction to standard controls: command buttons – Text boxes – labels – frames – option buttons – Check boxes – Scroll Bars – Timer – working with Common Dialog Control.

UNIT IV

The Image list control – the List view control – slider control – status bar control – Tool bar control – The Tree view control – Menu editor. –File System Controls (Drive, Dirlist, File List boxes).

UNIT V

OLE properties – OLE automation – building COM/OLE DLL servers – Data control – design time(for access – style databases) –programming with the data control– Database access – set using SQL –transaction control – testing the control – Open Database Connectivity.

OUTCOMES:

Upon completion of this course, the student will be able to:

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Implement syntax rules in Visual Basic programs.
- Write Windows applications using forms, controls, and events
- Write and apply decision structures for determining different operations.
- Write and apply loop structures to perform repetitive tasks.

REFERENCE BOOKS:

1. Mohammed Azam, Programming with Visual Basic 6.0 – Vikas Publishing House Pvt Ltd – 2002(unit-I, unit-II)
2. Content Development Group, Visual Basic 6.0 – Tata McGraw Hill Publishing Company Limited – 2002(unit-III, unit-IV, unit-V)

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20113AEC34A	Applied physics –I	4	1	0	5

AIM

To provide students with a broad and balanced foundation of physics knowledge and Practical Skill.

OBJECTIVES:

- To develop in students through an education in Physics a range of transferable skills of Value in physics and other areas.
- To instill in students a sense of enthusiasm for physics, and appreciation of its applications in different contexts.
- To provide students with a knowledge and skills base for further studies in physics or multi-disciplinary areas involving physics.

UNIT – I: ELECTROSTATICS

Gauss theorem and its application – Intensity at a point due to uniformly charged cylinders – Electrostatic potential – Equipotential surface – Capacitor – Principle of a capacitor – Spherical and cylindrical capacitors – Capacitors in series and in parallel – Energy of a charged capacitor – Energy loss due to sharing of charges.

UNIT – II: MAGNETOSTATICS

Magnetic field – Intensity of magnetization – Permeability – Susceptibility – Relation between them – Potential due to dipole – Relation between potential and intensity – Properties of dia, para, fero magnetic materials – Hysteresis – B.H curve.

UNIT – III: CURRENT ELECTRICITY

Ohm's law – Kirchoff's law – Application to Wheatstone's Bridge – Carey Foster Bridge – Potentiometer – Measurement of current and resistance – Calibration of low and high range voltmeter – Fleming's left and right hand rule – Theory of moving coil galvanometer – Ballistic galvanometers.

UNIT – IV: ELECTROMAGNETIC INDUCTION

Laws of Electromagnetic induction – Relation between induced emf and mutual inductance – Eddy current – Determination of self inductance – Anderson method – Co-efficient of mutual induction – Co-efficient of coupling – Transformer theory.

UNIT – V: ALTERNATING CURRENT

A.C Circuit with single components – Double components – Measurement of current and voltages – Power in A.C Circuits – Wattless current – Series and parallel resonance circuits – Q factor – Oscillatory discharge of a condenser.

Learning Outcomes:

Cognitive abilities and skills relating to solution of problems in Physics and Physics Related Disciplines

Practical skills relating to the conduct of laboratory and industrial work in

General skills relating to non-subject specific competencies, communication, ICT knowledge, interpersonal, organization skills and ethical standards.

REFERENCE BOOK:

- 1) Electricity and Magnetism – Brijlal and Subramaniam.
- 2) Electricity and Magnetism – Narayanamoorthi and Nagarathnam.
- 3) Electricity and Magnetism – D.L. Seghal and Chopra.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
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20120SEC35L	Visual Programming Lab	0	0	3	2
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1. Simple exercises using standard controls.
2. Write a program to design a calendar of any year.
3. Write a program to expand and shrinking an object – while program is running.
4. Write a code to design and implement a scientific calculator.
5. Write a program to create animation by using move method and timer Object.
6. Write a program for preparing students mark list.
7. Write a program to populate the label entities using data bound control.
8. Write a program to expand and shrink Objects using timer control and move method

Course Outcomes:

- Design,create,build and debug visual basic applications.
- Apply arithmetic operations for displaying numeric output.
- Apply decision structures for determining different operations.
- Write windows applications using forms,controls and events.
- Create one and two dimensional arrays for sorting,calculating and displaying of data.
- Write Visual Basic programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20113AEC36AL	Applied physics Lab-I	0	0	3	2

1. Semiconductor diode Characteristics
2. Zener diode characteristics
3. Transistor characteristics –CE Configuration
4. IC Regulated power supply
5. Post office Box-Resistance
6. Figure of merit of galvanometer.
7. Potentiometer- Ammeter Calibration
8. Potentiometer- Voltmeter Calibration
9. Zener Regulated Power supply.
10. Carey foster bridge

Course Outcomes:

- Practical skills relating to the conduct of laboratory and industrial work in
- General skills relating to non-subject specific competencies, communication, ICT knowledge, interpersonal, organization skills and ethical standards.
- Demonstrate a working knowledge of the basic concepts and theories of physics.
- Formulate hypotheses and devise and perform experiments to test a hypothesis as individuals and in a team.
- Effectively apply current technology and scientific methodologies for problem solving in various scientific, professional and community settings.
- Cognitive abilities and skills relating to solution of problems in Physics and Physics Related Disciplines

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120RMC37	Research Methodology	2	0	0	2

AIM:

To create a basic appreciation towards research process and awareness of various research publication.

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-based
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

PREREQUISITES:

Basic computer skill for working in window environment & conceptual knowledge on basic matrices.

UNIT-I Introduction to Research Methodology

Meaning of research – Objectives of research – Type of research – Significance of research – Research approaches.

UNIT-II Research Methods

Research methods versus Methodology – Research and scientific method – criteria of good research – Problems encountered by researchers in India.

UNIT-III Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Review – General treatises – Monographs.

UNIT-IV Database Survey

Database search – NIST –MSDS –PubMed – Scopus – Science citation index – Information about a specific search.

UNIT-V Introduction to MATLAB:

What is MATLAB? Matrix and its application in different areas: MATLAB approach to environmental modeling; Arithmetic Matrix – Operators; Arithmetic Array – Operators and its applications in MATLAB; Expressions, Opening M-Files; Structure of MATLAB Programming; Programming; Concatenation of strings; Vectorization ; Basic Graphics.

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computation frame works used in mathematical researches.

REFERENCES BOOK:

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi,2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Aim:

Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தாள் - IV

செய்யுள்- சங்க இலக்கியம், இலக்கணம்,இலக்கிய வரலாறு-மனப்பாடப் பகுதி

அலகு-I

எட்டுத்தொகை

நற்றினை – குறிஞ்சி 356,முல்லை-242, பாலை-397

குறுந்தொகை-2,18,25,58,67,69,135,167,283,373

ஐங்குறுநூறு சிறுவெண் காக்கைப் பத்து

அலகு-II

கலித்தொகை-பாலை 34,குறிஞ்சி-51,நெய்தல்-133

அகநானூறு - 36,147,332

புறநானூறு 34,173,189,235,279

அலகு-III

முல்லைப்பாட்டு

திருக்குறள்-ஐந்து அதிகாரம்- அறம் 2,பொருள் 2,இன்பம் -1

வான்சிறப்பு, அழக்காறாமை, இறைமட்சி, கூடாநட்பு, காதற்சிறப்புரைத்தல்

அலகு-IV

இலக்கணம்

அணி

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

எட்டுத்தொகை

பத்துப்பாட்டு

அறஇலக்கியங்கள்

தாள் - IV

ஒப்படைவு மதிப்பெண்-40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண்

பாரதியார், பாரதிதாசன் புதிய ஆத்திச்சூடி 20 மதிப்பெண்

பாரதியார்

அச்சம் தவிர், ஆண்மை தவறேல், இளைத்தல் இகழ்ச்சி, உடலினை உறுதி செய், எண்ணுவது உயர்வு, ஏறுபோல் நட, ஐம்பொறி ஆட்சி கொள், ஒற்றுமை வலிமையாம், காலம் அழியேல், கீழாருக்கு அஞ்சேல், குன்றென நிமிர்ந்து நில், கொடுமையை எதிர்த்து நில், சிதையா நெஞ்சு கொள், செய்வது துணிந்து செய், தீயாருக்கு அஞ்சேல், பெரிதினும் பெரிது கேள், வையத்தலைமை கொள், யாரையும் மதித்து வாழ்

பாரதிதாசன்

காற்றினைத் தூய்மை செய், குற்ற நினைவு தீர், தளையினைக் களைந்து வாழ் தூய நீராடு, தெருவெல்லாம் மரம் வளர், தைக்க இனிதுரை, தொன்மை மாற்று, நினைவினில் தெளிவு கொள், நீனிலம் உன் இல்லம், போர்த் தொழில் பழகு, மாறுவது இயற்கை, வையம் வாழ் வாழ்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்

Course Outcomes:

- Realize how the ancient people changed their life style according to the ages
- Learn how to change one's lifestyle according to the needs of the future
- Accept the modern trend and its uses.
- Obtaining More information about one's culture and tradition;
- Encourage creative writing and developing self-confidence.
- Aiming at enriching human excellence.

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Essentials of Business Communication

-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

Technical Communication

-Meenakshi Sharma & Sangeetha Sharma

English for writers and translators
English Work Book-I&II

-Robin Macpherson
-Jewelcy Jawahar

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

AIM:

To acquaint students with learning English through literature

OBJECTIVE:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

UNIT –I

How to be a Doctor -Stephen Leacock
My Visions for India -A.P.J. Abdul Kalam
Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning
The Toys -Coventry Patmore
I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin
The Verger -W.S Maugham
A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth
As You Like It

UNIT –V

Henry IV Tempest

OUTCOME:

Read and comprehend literature

REFERENCES:-

English for Enrichment

-.Devaraj Emerald Publishers

Selected Scenes from Shakespeare Book I &II

-Emerald Publishers

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC43	Active Server Programming	4	1	0	4

AIM

To equip the student to learn the Active Server Page

OBJECTIVE:

- To study about scripting languages concepts
- To understand scripting languages components
- To learn ADO cursors

UNIT I

Introduction to ASP-Active sever pages model-ASP file-The process of serving an active server page-Using scripting languages-Setting the primary scripting languages-Including other files-Understanding objects

UNIT II

Understanding components-Working with users-Working with HTML forms-retrieving form data-using text boxes and text areas

UNIT III

Cookies-Working with cookies-applications of cookies-addressing the drawbacks of using cookies-using cookies in ASP applications. Working with connections and data sources-creating connections with OLEDB and ODBC – connecting to Microsoft SQL server-Connecting to a Microsoft access database

UNIT IV

About the connection object – executing a SQL statement with the connection object-Understanding session and connection pooling – working with record sets-retrieving a record set-record set cursor and locking types-Understanding ADO cursors-paging through a record set

UNIT V

Working with the command object-creating stored procedures-executing stored procedures with the connection object –executing stored procedures with the command object – retrieving parameter information

OUTCOMES

- Explain concepts of Active Server Pages.
- Apply methods and properties of various objects and components of ASP
- Develop Dynamic real life website using the concept of ADO and ASP.

REFERENCE BOOK:

1. Practical ASP-Ivan bayross, BPB Publications, 2000

2. Special Edition using Active Server Pages – Scot Johnson, Prentice Hall of India Private Limited 2001

EMPLOYABILITY,/ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
20113AEC44A	Applied physics –II	5	1	0	5

AIM:

To prepare the student for the study of physics by introducing general concepts and methods this will be applied throughout the course.

OBJECTIVES:

- To introduce and develop the fundamental techniques of experiment in physics.
- Introduce the student to the basic concepts in electricity and magnetism.
- To expose the students to experiments in Light, Modern Physics, AC circuits, and Devices.
- To introduce the student to elementary alternating current circuits

UNIT – I: SEMI CONDUCTOR PHYSICS

Theory of Energy bands in crystals – Distinction between conductors, insulators and semiconductors – Hall effect in semi conductors – Zener diode – Tunnel diode – Backward diode – Breakdown voltage – Avalanche Breakdown.

UNIT – II: TRANSISTORS

NPN and PNP transistors – Characteristics of CE and CB configurations – H-Parameters – Transistor as an amplifier and oscillator – FET – N-Channel and P-Channel – FET Characteristics – FET amplifier.

UNIT – III: LASER AND MASERS

Basic concepts of stimulated emission – Principles of Laser – Population inversion and Meta stable state – Ammonia maser – Ruby laser and He-Ne laser production – Applications of laser and maser.

UNIT – IV: OPTO ELECTRONIC DEVICES

LED – LED Voltage and current – Advantages of LED – Applications of LED's – Photo diode – Photo diode operation – characteristics of photo diode – Photo transistor – Seven segment display.

UNIT – V: OPERATIONAL AMPLIFIER

The basic operational amplifier – Inverting and Non inverting operational amplifiers – CMRR – Basic uses of operational amplifier as Integrator, Differentiator, Adder, Subtractor – D/C Binary weighted method – R-2R method.

Learning Outcomes:

The Applied Physics program will produce intellectually engaged graduates accomplished in application of fundamental physics principles, and prepared for direct entry into the workplace or continuing professional development. Demonstrate a working knowledge of the basic concepts and theories of physics.

REFERENCE BOOK:

1. Principles of Electronics – V.K. Metha, S. chand and Co.,
2. Electronic Devices and Circuits – Millman and Halkias.
3. The Fundamentals of solid state physics – Theraja.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
201ENSTU45	Environmental Studies	2	0	0	2

AIM:

To create the awareness about environmental problems among the students.

OBJECTIVE:

- It deals with the study of flow of energy and materials in the environment
- It deals with the study of natural and its function

UNIT-I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance - Need for public awareness - **Natural Resources: Renewable and Non-Renewable Resources** - Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources.

UNIT-II

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Types of ecosystem - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems.

UNIT-III

Biodiversity and its Conservation – Definition - Genetic, species and ecosystem diversity - Biogeographical classification of India - Values of biodiversity - Biodiversity at global, National and local levels - India as a mega - diversity nation - Hot-spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity.

UNIT-IV

Environmental Pollution – Definition - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Solid waste Management - Role of an individual in prevention of pollution - Disaster management.

UNIT-V

Social Issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics - Climate change green house effect and global warming - Ozone depletion - Waste land reclamation - Consumerism and waste products - Environmental Legislation - Issues involved in enforcement of environmental legislation - Public awareness - Human Population and the Environment.

EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT

Course Outcomes:

- Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

REFERENCE BOOK:

1. "ENVIRONMENTAL STUDIES", K.Kumarasamy, A.Alagappa Moses, M.Vasanthi.

Course Code	Course Title	L	T	P	C
20120SEC46L	Active Server Programming Lab	0	0	3	2

1. Create an ASP file to display the message “Have a good Week end” if it a Saturday other wise “Have a nice day”
2. Write an ASP program to get the rollno and display the corresponding name & mark details
3. Create a login form to expire if the user does not type the password within 100 seconds.
4. Create an advertisement for a book shop using Ad Rotator component.
5. Create a course registration form with name, address and list of available course. Reply with the corresponding course fees on selection of a single course or a collection of courses.
6. Write an ASP program to manipulate cookies with the information between HTTP sessions such as
 - a. Last date visited
 - b. Last Time visited
 - c. Number of visits
7. Create a student database and manipulate the records using the connection object in ASP
8. Create an employee database and manipulate the records using command object in ASP

Course Outcomes:

Contrast and compare major elements of the .NET Framework and explain how C# fits into the .NET platform.

Analyze the basic structure of a C# application and be able to document, debug, compile, and run a simple application.

Create, name, and assign values to variables.

Use common statements to implement flow control, looping, and exception handling.

Create methods (functions and subroutines) that can return values and take parameters.

Create, initialize, and use arrays.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20113AEC47AL	Applied physics Lab –II	0	0	3	2

- 1) FET-Characteristics
- 2) Logic Gates-Universality of NOR Gate.
- 3) LCR — Series Resonance Circuit.
- 4) LCR parallel – resonance circuit.
- 5) OP AMP-Addition,Subtraction.
- 6) Verification basic logic gates.
- 7) Verification of Demorgon’s theorem..
- 8) Half adder and Half subtractor.
- 9) Logic Gates-Universality of NAND Gate.
- 10) OP AMP Differentiator ,Intergrator.

Course Outcomes:

- Effectively use and critically evaluate current technical/scientific research literature, online information, as well as information related to scientific issues in the mass media.
- Integrate and relate scientific knowledge learned from classroom with real life situations.
- Communicate in written and oral forms with interested citizens and professionals on key concepts in physics and general scientific issues.
- Work cooperatively as part of a research team.
- Maintain life-long learning in the sciences and incorporate new information into the existing body of knowledge.
- Outline the applications of physics in industry and the role of physicists as entrepreneurs.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

- a. **Understanding Leadership and its Importance**
 - What is leadership?
 - Why Leadership required?
 - Whom do you consider as an ideal leader?
- b. ***Traits and Models of Leadership***

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

*c. **Basic Leadership Skills***

- Motivation
- Team work
- Negotiation
- Networking

UNIT II - Managerial Skills

*a. **Basic Managerial Skills***

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

*b. **Self Management Skills***

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

*a. **Basics of Entrepreneurship***

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

*b. **Creating Business Plan***

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

*a. **Innovative Leadership***

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

*b. **Design Thinking***

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation

- Experimentation
- Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019- 02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC51	Data Communication and Networking	4	1	0	4

AIM:

To equip the students with Computer Networks and its security.

OBJECTIVES:

- To learn basic network concepts.
- To understand various switching techniques and protocols.
- To study about wireless technology and network security.

UNIT-I

Introduction-Components-Topologies-Categories of Network-OSI model-TCP/IP suite - Addressing.

UNIT-II

Transmission media-Connecting Devices-Error detection and correction-Flow and Error Control-piggy backing- IEEE standard.

UNIT-III

Switching-Namespace- DNS - TCP/UDP- Ipv4 vs Ipv6 - Remote logging- SMTP-POP-IMAP-FTP

UNIT-IV

Wireless WAN: Cellular telephony- Generations- Satellite-GSM-GPRS-Internet-WWW-HTTP

UNIT-V

Attacks-Web security consideration-SNMP-Secure Socket Layer- Principles of public key cryptography- Digital signature-Key management-Intruders and viruses-Firewall.

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the components required to build different types of networks.
- Identify solution for each functionality at each layer.
- Trace the flow of data from one node to another node.

REFERENCE BOOK:

- 1."Data Communications and Networking "Behrouz A Forouzan, TATA McGraw-Hill
- 2." Network Security Essentials" William Stallings, Pearson Education
3. "Data and Computer Communications", William Stallings, Pearson Education

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC52	Operating System	4	1	0	3

AIM:

To equip the students with operating system and their components

OBJECTIVES:

- To learn the fundamental functionality of Operating system
- To understand the memory management, process management
- To study about I/O management, storage management

UNIT I

Evolution of Operating System – Types of Operating System – Different views of Operating System – Design and Implementation of Operating System – I/O Programming concepts – Interrupts Structure & Processing.

UNIT II

Memory Management : Single Contiguous Allocation – Partitioned Allocation – Relocatable Partitioned Allocation – Paged and Demand – Paged Memory Management – Segmented Memory Management – Segmented and Demand – Paged memory Management – Swapping and overlay techniques.

UNIT III

Process Management : Job Scheduling – Process Scheduling – Functions and Policies – Evaluation of Round Robin multiprogramming performance – Process Synchronization – Race Condition – Synchronization Mechanism – Deadly Embrace, Prevention , Avoidance and Detection and Recovery Methods.

UNIT IV

Device Management : Techniques for Device Management – Device Characteristics – I/O Traffic Controller, I/O Scheduler, I/O Device Handler – Virtual Devices – Spooling.

UNIT V

File management: Simple file system, General Model of a file system, Physical and Logical file system.

OUTCOMES:

At the end of the course, the student should be able to:

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.

REFERENCE BOOK:

1. Operating Systems by Stuart E. Madnick and John J. Donovan – Tata McGraw Hill Publishing Company Ltd.
- 2.. Operating Systems (Concepts and Design) Milan Milenkovic – McGraw Hill International Edition

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20120SEC53	Microprocessor and its Applications	4	1	0	4

AIM

To equip the students with the architecture and instruction sets of different Microprocessors and to design systems using microprocessors.

OBJECTIVE

- To study the architecture of microprocessors like 8085 and higher versions
- To understand the Assembly language programming
- To know the methods of connecting them to the peripheral devices.
- To learn the basic concepts and Microprocessor applications

UNIT I

Evolution of microprocessors – single chip microcomputers – memory buses -memory address capacity – Intel 8085 – instruction cycle – timing diagram.

UNIT II

Instruction set of Intel 8085 – instruction and data formats – addressing modes – status flags – Intel 8085 instruction – programming of microprocessors – assembler – stacks and subroutines – macros and microprogramming.

UNIT III

Assembly language programming – simple examples – addition and subtraction of binary and decimal numbers – complements – shift – masking – finding max and min number in an array-arranging a series of numbers – multiplication , division, multi-byte addition and subtraction.

UNIT IV

Peripheral devices and interfacing – address space partitioning – memory and I/O interfacing – data transfer schemes – interrupts of Intel 8085 – interfacing devices and I/O devices – I/O ports – programmable peripheral interface.

UNIT V

Microprocessor applications - delay subroutines – interfacing of 7 segment LED displays – frequency measurement – temperature measurement and control – water level indicator-microprocessor based traffic control.

OUTCOMES:

At the end of the course, the student should be able to:

- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems

REFERENCE BOOK:

1. Fundamental of microprocessor and microcomputers – Badri ram – Fifth revised and enlarged edition – Dhanpat rai publications – 2001.
2. Microprocessor architecture, programming and application with 8085 – Ramesh S. Goankar.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C

20120DSC54A	Cloud Computing	4	1	0	3
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AIM:

To provide a strong foundation in Developing Cloud Services.

OBJECTIVES:

- To understand the concept of Cloud Computing.
- To get an idea about Sharing Files.

UNIT I

Understanding Cloud Computing: An introduction to Cloud Computing – Computing in the Cloud – Developing Cloud Services.

UNIT II

Cloud Computing for the Family – Cloud Computing for the Community – Cloud Computing for the Corporation

UNIT III

Collaborating on Calendars, Schedules and Task Management – On Event Management – On Contact Management – On Project Management – On Word Processing – On Spreadsheets – On Databases – On Presentations

UNIT IV

Storing and Sharing Files and other online content – Sharing Digital Photographs – Controlling it all with Web-Based Desktops

UNIT V

Collaborating via Web-Based Communication Tools – Collaborating via Social Networks and Groupware – Collaborating Via Blogs and Wikis

OUTCOMES:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player , Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services and Set a private cloud

REFERENCE BOOK:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson, 2009.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
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20120DSC54B	Middleware Technology	4	1	0	3
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UNIT I

CLIENT / SERVER CONCEPTS

9

Client-Server – File server – Database server – Group server – Object server –
 Webserver – Middleware – General middleware – Service specific middleware – Client
 /server building blocks – RPC.

UNIT II

EJB ARCHITECTURE

EJB – EJB architecture – Overview of EJB software architecture – View of EJB
 –Conversation – Building and Ddeploying EJBs – Roles in EJB.

UNIT III

EJB APPLICATIONS

EJB session beans – EJB entity beans – EJB clients – EJB deployment – Building an
 application with EJB

UNIT IV

CORBA

CORBA – Distributed systems – Purpose – Exploring CORBA alternatives
 –Architecture overview – CORBA and networking Model – CORBA object model –IDL –
 ORB – Building an application with CORBA.

UNIT V

COM

COM – Data types – Interfaces – Proxy and stub – Marshalling – Implementing
 Server/Client – Interface pointers – Object creation – Invocation – Destruction
 –Comparison COM and CORBA.

TEXT BOOKS

1. Robert Orfali, Dan Harkey and Jeri Edwards, “The Essential Client/Server Survival Guide”, Galgotia Publications Pvt. Ltd., 2002.
2. Tom Valesky, “Enterprise Java Beans”, Pearson Education, 2002
3. Jason Pritchard, “COM and CORBA side by side”, Addison Wesley, 2000
4. Jesse Liberty, “Programming C#”, 2nd Edition, O’Reilly Press, 2002.

Course Outcome:

- To understand how middleware facilitates the development of distributed applications in heterogeneous environments
- To study how it helps to incorporate application portability, distributed application component interoperability and integration.
- Understand Distributed systems design and implementation
- Understand existing Distributed Technologies
- Understand Web services architectures

REFERENCES

1. Mowbray, “Inside CORBA”, Pearson Education, 2002.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20120DSC54C	Enterprise resource planning	4	1	0	3

COURSE OBJECTIVE

- Become familiarize with ERP process.
- Learn ERP implementation process using information technology.

COURSE OUTCOMES

- Design and Develop ERP applications by using features of ERP tools.

UNIT I BASICS OF ERP

ERP essentials – ERP evolution – ERP market – ERP tiers – information systems – Presentation tier – application tier – database tier.

UNIT II ENTERPRISE SYSTEMS

Enterprise systems – stand alone mainframe systems – client server architecture – service oriented architecture – types of enterprise systems – types of data – SAP overview.

UNIT III PROCESS IN ERP

Basic Procurement process – physical flow – document flow – information flow – financial impact- role of enterprise systems in the procurement process – fulfillment process – production process.

UNIT IV INTEGRATION

Integrated processes – Integrated processes execution – additional intracompany processes – extended (intracompany) processes.

UNIT V CASE STUDY

ERP for construction industry – ERP for a corrugated box manufacturing company – ERP for lens making company – ERP for furniture manufacturing company – ERP for toys manufacturing company - Mc Donald's story – Automobile enterprises.

REFERENCE BOOKS:

1. Simha R Magal, Jeff Word, “Essentials of Business Processes and Information Systems”, Wiley Publications, 2009.
2. Marianne Bradford, “Modern ERP: Select, Implement and use Today's advanced business systems”, Lulu Publishers, Second Edition, 2010.
3. Jyotindra Zaveri, “Enterprise Resource Planning”, Second edition, Himalaya Publishing house, 2012.

Course Outcomes:

- Make basic use of Enterprise software, and its role in integrating business functions.
- Analyze the strategic options for ERP identification and adoption.
- Design the ERP implementation strategies.

- Create reengineered business processes for successful ERP implementation.
- "To aim at preparing the students technological competitive and make them ready to
- self-upgrade with the higher technical skills.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC55L	Microprocessor Lab	0	0	3	2

The following programming exercises using 8085 instruction set,

1. 8-bit addition & subtraction
2. 8-bit multiplication & division
3. Multi byte addition
4. Multi byte subtraction
5. Sum of series & data transfer
6. Maximum & minimum values
7. Hexadecimal to decimal and decimal to hexadecimal conversion
8. Sorting the numbers

Course Outcome:

- Identify relevant information to supplement to the Microprocessor and Microcontroller course.
- Set up programming strategies and select proper mnemonics and run their program on the training boards.
- Practice different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.
- Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases.

- Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools.

SKILLDEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC56L	Operating System Lab	0	0	3	2

1. Write a menu driven shell program for the following :

- a. List of files.
- b. Processes of users.
- c. Today's Date
- d. Users of system.
- e. Quit of Unix

2. Write a shell program which accepts the name of a file from the standard input and tests to find the file access permissions, such as read, write and execute.

3. Write a shell program which accepts the name of a file from the standard input and perform the following

- a. Accept five names in a file.
- a. Sorts the names in existing file.
- b. Lists unsorted and sorted file.
- c. Quit

4. Write a menu driven shell program to copy, edit, rename and delete a file.

5. Write a menu driven shell program to perform the following task

- a. Write a sentence in file.
- b. Search for a given word or pattern in an existing file.
- c. Quit.

6. Write a shell program to prepare electricity bill for domestic consumers.

For first 100 units – Rs. 0.75 / Unit

For next 100 units – Rs. 1.50 / Unit

Above 200 units – Rs. 3.00 / Unit

Prepare the bill for the following format.

7. Write a shell program to display the result PASS or FAIL using the

information given below student name ,student reg.no.,

mark1,mark2,mark3,mark4 the minimum pass for each subject is 50.

8. Merge the contents of the file file1,file2 and store in another file.

Course Outcome:

- Install a Linux operating system with a custom partitioning scheme and log into and out of a UNIX/Linux computer system using graphical and command line environments.

- Use UNIX/Linux command line (shell) commands to navigate and manage the UNIX/Linux file system, customize the user shell environment,
- Use archiving and compression to back up files.
- Use file name globing and regular expressions to find files and text in the system.
- To Manage user and group accounts and permissions.
- To Manage processes and jobs.

SKILLDEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Aim:

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
 - Difference between a CV, Resume and Bio data
 - Essential components of a good resume
- ii. Resume skills : common errors*
- Common errors people generally make in preparing their resume
 - Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

- i. Interview Skills : Preparation and Presentation**
- Meaning and types of interview (F2F, telephonic, video, etc.)
 - Dress Code, Background Research, Do's and Don'ts
 - Situation, Task, Approach and Response (STAR Approach) for facing an interview
-
- Interview procedure (opening, listening skills, closure, etc.)
 - Important questions generally asked in a job interview (open and closed ended questions)
- ii. Interview Skills : Simulation**
- Observation of exemplary interviews
 - Comment critically on simulated interviews
- iii. Interview Skills : Common Errors**
- Discuss the common errors generally candidates make in interview
 - Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC61	.NET Programming	4	1	0	4

AIM

To cover the fundamental concepts of the .NET framework.

OBJECTIVES

- To gain knowledge in the concepts of the .NET framework and its technologies.
- To get experience in building sample applications of large-scale projects.

UNIT I

Visual basic.NET and the .NET Framework –The elements of Visual Basic .NET

UNIT II

Visual Basic .NET operators-software Design, conditional structures, and controls Flow-Methods.

UNIT III

Interfacing with the End user-Asp.NET Applications.

UNIT IV

Web Form Fundamentals – Web Controls – Validation and Rich Controls.

UNIT V

ADO.NET Data Access – Data Binding –Data List, DataGrid, and Repeater.

OUTCOMES:

- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio.
- Utilize the .NET environment to create Web Service-based applications and components.

REFERENCE BOOKS:

1. The Complete Reference VB.NET – Jeffrey R-Shapiro- Tata McGrawHill Edition
2. The Complete Reference ASP.NET- Matthew MacDonald- Tata McGrawHill Edition
3. Visual Basic .Net Programming -Bible.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20120SEC62	Relational Data Base Management System	4	1	0	5

AIM

To equip the students with principles and concepts of database design

OBJECTIVE

- To learn the basic principles of database and database design
- To learn the basics of RDBMS
- To learn the concepts of database manipulation SQL

UNIT I

An Overview of Database Management-Introduction -Definition of Database system - Data Independence - Relational Systems - Database System Architecture - Three Levels of the Architecture - Distributed Processing.

UNIT II

An Introduction to Relational Databases- Introduction - Relational Model - Relations and Relvars - Optimization - Transactions - An Introduction to SQL - Embedded SQL - Domains , Relations , Relvars

UNIT III

Relational Algebra - Introduction - Syntax - Semantics - Examples - Additional Operators - Relational Calculus - Introduction - Tuple Calculus - Examples - Calculus Vs Algebra - Domain Calculus - SQL Specialties .

UNIT IV

Database Design - Functional Dependencies - Introduction - Basic Definitions - Normalization - First , Second ,Third Normal Forms - BOYCE / CODD Normal Form.

UNIT V

Transaction Management - Recovery - Introduction - Transactions - Transaction Recovery - System Recovery - Media Recovery - Concurrency -Three Concurrency Problem - Locking - Deadlock - Serializability .

OUTCOMES:

At the end of the course, the student should be able to:

- Design Databases for applications.
- Use the Relational model, ER diagrams.
- Apply concurrency control and recovery mechanisms for practical problems.
- Design the Query Processor and Transaction Processor.
- Apply security concepts to databases.

REFERENCE BOOK:

" An Introduction to Database Systems - C.J.DATE Addison - Wesley Publications - 7th Edition 2000

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120DSC63A	Data Mining	4	1	0	3

AIM:

To emphasis on the design aspects of Data mining and Data Warehousing.

OBJECTIVE

- To understand briefly some of the data mining Techniques.
- Discuss a number of more efficient algorithms.
- To know accuracy of classification methods and how accuracy may be improved.

UNIT-I

Introduction: What is Data Mining- Why Data Mining now-The Data Mining Process-Data Mining Application-Data Mining Techniques-The Future of Data Mining-Guidelines for Successful Data Mining-Data Mining Software-Software Evaluation and Selection.

UNIT-II

Association Rules Mining: Introduction-Basics-The Task and a Naïve Algorithm - The Apriori Algorithm- Improving the Efficiency of the Apriori Algorithm- Apriori-Tid -Direct Hashing and Pruning (DHP)-Dynamic Itemset Counting (DIC)-Mining Frequent Pattern without Candidate Generation (FP-Growth)-Performance Evaluation of Algorithms- Software for Association Rule Mining

UNIT-III

Classification: Introduction-Decision Tree-Building a Decision Tree-The Tree Induction Algorithm-Split Algorithm Based on Information Theory-Split Algorithm based on the Gini

Index-Over fitting and Pruning-Decision Tree Rules-Naïve Bayes Method-Estimating Predictive Accuracy of Classification Methods-Improving Accuracy of Classification Methods.

UNIT-IV

Cluster Analysis: What is Cluster Analysis-Desired Features of Cluster Analysis-Types of Data-Computing Distance-Types of Cluster Analysis Methods-Partitional Methods-Hierarchical Methods-Density-Based Methods-Dealing with Large Databases-Quality and Validity of Cluster Analysis Methods-Cluster Analysis Software.

UNIT-V

Web Data Mining: Introduction-Web Terminology and Characteristics-Locality and Hierarchy in the Web-Web Content Mining-Web Usage Mining-Web Structure Mining-Web Mining Software.

OUTCOMES:

- Understanding of data mining software available on the market.
- Acquiring Knowledge about various algorithms.
- Acquiring Knowledge about cluster analysis techniques.

REFERENCE BOOKS:

1. “Introduction to Data Mining with Case Studies”, G.K.Gupta, Easter Economy Edition.

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20120DSC63B	Artificial Intelligence and Expert Systems	4	1	0	3

AIM:

To Acquire Knowledge on various AI Techniques and Expert Systems.

OBJECTIVE:

- To learn AI Basic Concepts
- To understand Expert Systems Architectural-Components
- To study Expert System development process

UNIT I

The AI definition - AI Techniques- Problems, Problem Space and search- Defining the problem as a state space search- Problem Characteristics- Heuristic Search Techniques- Generate and Test- hill Climbing- Best First Search- Problem reduction - Constraint Satisfaction- means -ends analysis.

UNIT II

Game Playing- Min-Max Procedure- Adding Alpha-Beta Cutoffs- Additional Refinements- Searching AND/OR Graphs - Using Predicate Logic- Representing Simple Facts and Logic- Representing instance and IS a relationships- Computable functions and predicates- Use of the predicate calculus in AI Resolution- natural deduction.

UNIT III

Representing knowledge using rules- Procedural versus declarative knowledge- Logic Programming- Forward versus Backward Reasoning- Resolving within AND/OR Graphs matching- control knowledge-Symbolic Reasoning under uncertainty- Non-monotonic reasoning- Implementation issues- - Fuzzy Logic.

UNIT IV

Expert Systems- Architectural-Components- Explanation facilities- Knowledge acquisition.

UNIT V

Expert System development process- Non-formal representation of knowledge- Semantic networks- Frames- Scripts- Expert System Tools.

OUTCOMES:

At the end of the course, the student should be able to:

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalize a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.

REFERENCE BOOK

1. For Units I, II, III: Elaine Rich and Kevin Kaight, “**Artificial Intelligence**”, Tata McGraw Hill, 2nd Edition, 1991.
2. For Units IV, V: David W. Rolston, “**Principles of Artificial Intelligence and Expert Systems Development**”, McGraw Hill.
Nills J.Nilsson “**Artificial Intelligence** “, Narosa Publicshing House, 1990.

EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120DSC63C	Ethical hacking	4	1	0	3

OBJECTIVES:

To understand and analyse Information security threats & countermeasures

To perform security auditing & testing

To understand issues relating to ethical hacking

To study & employ network defense measures

To understand penetration and security testing issues

UNIT I ETHICAL HACKING OVERVIEW

Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack.

UNIT II FOOTPRINTING & PORT SCANNING

Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.

UNIT III SYSTEM HACKING

Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

UNIT IV HACKING WEB SERVICES & SESSION HIJACKING

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.

UNIT V HACKING WIRELESS NETWORKS

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Course Outcome:

- Plan a vulnerability assessment and penetration test for a network.
- Execute a penetration test using standard hacking tools in an ethical manner.
- Report on the strengths and vulnerabilities of the tested network.
- Identify legal and ethical issues related to vulnerability and penetration testing.
- Use of standard hacking tools in an ethical manner
- Evaluation of the penetration test results

EMPLOYABILITY, /SKILL DEVELOPMENT

REFERENCES

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006
4. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). PacktPublishing, 2011

COURSE CODE	COURSE TITLE	L	T	P	C
201ENOEC	Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition – Kinds – Elements – Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub Editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

References:-

Journalism -Susan

Professional Journalism - John Hogenberg

News Writing and Reporting - M.James Neal (Surjeet Publication)

Professional Journalism -M.V Komath

The Journalist’s Handbook -M.V Komath

Mass Communication & Journalism - D.S Mehta

EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILLDEVELOPMENT

COURSE CODE	COURSE TITLE	L	T	P	C
201MAOEC	Development Of Mathematical Skills	4	0	0	2

Objectives

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.

To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

1. P.A.Navanitham, Business Mathematics & Statistics
2. Kanti swarup, P.K.Gupta and Manmohan, “ Operations Research”

Learning outcomes

- By the end of this course, you should be able to
- know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, statistics, Matrices and Business mathematics)
- use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Course Code	COURSE TITLE	L	T	P	C
201PHOEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.

A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data. Understand that there are finite limits to our ability to make good measurements, and why.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges : AC bridges – Maxwell, Owen, Schering and deSauty’s bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.

Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhney – Dhanpat Rai and Sons – 1990.

2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

EMPLOYABILITY

Course Code	COURSE TITLE	L	T	P	C
201CHOEC	Food and Adulteration	4	0	0	2

Aim: To introduce students to food safety and standardization act and quality control of foods.

Objectives:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislative aspects of adulteration.
3. To educate about standards and composition of foods and role of consumer.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Outcomes:

- Ability to apply principles of food engineering in industry.
- Understand, identify and analyze a problem related to food industry and ability to find an appropriate solution for the same.
- Design, implement and evaluate a research based project to meet demands of the society.
- Use appropriate techniques, skills, and modern tools in the food industry and in academic profession.
- Understanding of professional, ethical, legal, security and social issues and responsibilities for entrepreneurship skills.

EMPLOYABILITY,/ENTREPRENEURSHIP

Course Code	COURSE TITLE	L	T	P	C
201MBOEC	Wild Life Conservation	4	0	0	2

Aim:

To enable the students understand the need of conservation of wildlife in India.

Objectives:

Maintenance of rare species in protected areas such as national parks, santuries etc.,
Establishment of specific biosphere reserves for endangered plants and animals.
Protection of wild life through legislation such as banning hunting etc.,
Imposing specific restrictions on export of endangered plants and animals or their products.

Outcome:

Protection of natural habitats of organisms through controlled exploitation.
Educating the public about the need to protect and preserve the environment as a long range goal for the welfare of future generations

Unit I: Wildlife Management: Basic concepts and principles - Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA –

Evaluation of Wildlife habitat: Define habitat – Forest habitat types - basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect – Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species.

Unit II: Introduction to conservation biology, the origin of conservation biology, ethical and economical values of conservation biology, definition of biodiversity, types of biodiversity, threats to biodiversity. Scopes and importance of conservation methods – *In-situ* and *Ex-situ* conservation approaches of Indian animals. Captive breeding (Lion-tailed macaque, white tiger and vultures) and reintroduction (Tiger, rhinoceros, gaur).

Unit III: Biodiversity: Definition and importance - Biodiversity hotspots in India: Western Ghats, Eastern Himalayas. Mega diversity nations – an introduction. Landscape approach and people participation in biodiversity conservation.

Unit IV: Role of Government and Non-Government organizations in conservation.–
Government - Wildlife Institute of India, Ministry of Environment and Forests (MoEF), National Biodiversity Authority (NBA), Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Salim Ali Centre for Ornithology and Natural History (SACON), Centre for Ecological Sciences (CES). **NGOs.** –Bombay Natural History Society (BNHS), World Wide Fund for Nature (WWF), Wildlife Trust of India (WTI), Nilgiri Wildlife and Environment Association (NWEA), Wildlife Conservation Society (WCS).

Unit V: Conservation Biology Tools - Biological Parks, Zoological Parks, Forest Research Institute, Agricultural Research Institutions, Gene Pools, Cryopreservation Centres, Interpretation Centres and role of Field Biologists.

References:

1. Anon, 1992. Conservation on biological diversity. Text and annexure – WWF-India.
2. Gaughley, G. and A. Gunn. 1995. Conservation Biology in Theory and practice. Blackwell Publishers.
3. Dobson, A.P. 1996. Conservation and biodiversity scientific American Library, New York, USA.

SKILL DEVELOPMENT

COURSE CODE	COURSE TITLE	L	T	P	C
201CSOEC	Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

UNIT I

Introduction to the Internet: networking- internet – email – Internet Technologies: modem internet addressing .

UNIT II

Internet browsers: Internet Explorer – Netscape navigator- Introduction to HTML: Html document – anchor tag – hyperlink.

UNIT III

Head and body sections: Header section – titles – links- colorful web page – sample html document – Designing the body section: paragraph – tab setting.

UNIT IV

Ordered and unordered lists: list – unordered list – heading in a list- order list- nested list.

UNIT V

Table handling: tables – table creation in html cell spanning multiple rows and columns- coloring cells- sample tables- frames frame set definition- nested frames set.

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

REFERENCE BOOKS

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

EMPLOYABILITY

B.COM

COURSE CODE	COURSE TITLE	L	T	P	C
201CMOEC	BANKING SERVICES	5	0	0	5

AIM:

To Provide the Bank is financial institution which is involved in borrowing and lending money.

OBJECTIVE: you should be able to

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits- Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking- Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features- Registration- Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM- Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking, ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh,Justinpaul

EMPLOYABILITY

Course Code	Course Title	L	T	P	C
20120SEC64L	.NET Programming Lab	0	0	3	2

1. Write a program in VB. Net to check whether given number is Odd or Even.
2. Write a program to find maximum from given numbers.
3. Write a program to find are of a circle
4. Design ASP.Net web form using Html Server Controls to enter job seeker’s details.
5. Create an ASP.Net web form using Web control to enter E-Mail registration form.
6. Apply appropriate validation techniques in E-Mail registration form using
7. Validation controls.
8. Write an ASP.Net application to retrieve form data and display it the client browser in a table format.
9. Create a web application using ADO.Net that uses which performs basic data Manipulations:
(i). Insertion (ii) Updating (iii) Deletion (iv) Selection
Hint: Do operations using Ms-Access and SQL-Server
10. Create an application using Data grid control to access information’s from table in SQL server.

Course Outcomes:

- Contrast and compare major elements of the .NET Framework and explain how C# fits into the .NET platform.
- Analyze the basic structure of a C# application and be able to document, debug, compile, and run a simple application.
- Create, name, and assign values to variables.

- Use common statements to implement flow control, looping, and exception handling.
- Create methods (functions and subroutines) that can return values and take parameters.
- Create, initialize, and use arrays

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
20120SEC65L	Oracle Lab	0	0	3	2

1. Write SQL queries to create the following tables and insert rows in it.
Employee (eno, ename, deptno, salary, designation)
Dept (deptno, deptname, location)
Student (rollno, name, course, paper1, paper2, paper3)
2. Write SQL queries to create primary key and foreign key constraints in the above given tables and perform all types of simple retrieval.
3. Write SQL queries to perform all types of advance retrieval using (i) nested sub queries (ii) set operators.
4. Write SQL queries to perform all types of joins.
5. Write SQL queries to illustrate all built-in functions.
6. Write SQL queries to create views and index/indices for the tables Employee, Dept and Student.
7. Write a database trigger to prevent transactions during weekend. Create PL/SQL procedures and store them in a package and execute them in the command prompt.
8. Write a PL/SQL program that prints mark sheet of students in a University using cursor.
9. Payroll using forms
10. Mark sheet processing using forms

Course Outcomes:

- Brief knowledge about SQL Fundamentals
- Unary and Binary table Operations.
- Able to handle with different database languages.
- Table view, Log and Triggers.
- Handling online Transactions.
- Database Connectivity with front-end.
-

Course Code	Course Title	L	T	P	C
20121PRW66	Project Work	0	0	0	4

Each student will develop and implement individually developed application software based on any of the latest technologies.

SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Aim:**Course Objectives:**

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages” (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

EMPLOYABILITY,/ENTREPRENEURSHIP

Course Code	Course Title	L	P	T	C
201ACSSBBE	Basic Behavioural Etiquette				

Aim:

Objectives:

Training is mainly focused on discipline, grooming, career planning and building personality. As it is the first year of the university, students are given awareness about the job market right from the start so that they prepare accordingly at their own pace and potential.

Eliminating negative thought, developing enriching habits, unlocking individual potentials and well versed communication is the aim of this program. The module consists of

- Communication Skills
- Goal Setting
- Career Planning
- Reaching your Potential
- Time Management
- Stress Management
- Grooming and Discipline
- Learning skills
- Listening Skills
- Team Building

Outcomes:

- Etiquette helps us to be thoughtful about our conduct.
- It helps us to be aware of the feelings and rights of others. By eliminating discourteous behaviour and prioritising other people's feelings, etiquette promotes kindness, consideration, and humility.
- Business etiquette training, a key part of soft skills & communication, facilitated by Momentum enlightens participants on the accepted behaviour patterns and manners key to their profession.
- It emphasises on a set of practices used and accepted in a multi-national work environment.

EMPLOYABILITY

Course Code	Course Title	L	P	T	C
201ACSSAQA	General Aptitude and Quantitative Ability				

Aim:

1. General Aptitude

- Introduction
- Introduction to Aptitude Tests
- Diagnostic Tests
- Introduction to Speed Maths
- Quantitative Ability – Number Theory
- Numbers
- Properties of Numbers
- Concept of Multiples and Factors
- LCM and HCF
- Factorial Concept
- Last Digit Concept
- Remainders Concept

Quantitative Ability – Arithmetic - 1

- Percentage
- Ratio and Proportion
- Simple Interest and Compound Interest
- Profit Loss
- Discount
- Mixture and Allegation
- Questions from Company Papers will be discussed

Quantitative Ability – Arithmetic - 2

- Speed Distance Time
- Time and Work
- Chain Rule
- Clocks and Calendars
- Averages
- Questions from Company Papers will be discussed

Quantitative Ability – Algebra

- Basic Terminologies in Algebra
- Equations
- Simple Equation
- Quadratic Equation
- Cubic Equation
- Functions
- Graphs
- Maxima and Minima
- Questions from Company Papers will be discussed

Quantitative Ability – Modern Maths

- Set Theory
- Fundamental way of Counting
- Permutations and Combinations
- Probability
- Questions from Company Papers will be discussed
- Data Analysis
- Data Sufficiency

Analytical and Logical Reasoning

- Mono variate conditions
- Multi variate conditions

Puzzles

- Coding
- Decoding
- Family tree
- Direction sense
- Alpha numeric
- Brain teasers

Deductive Reasoning

Visual Sequence

Mathematical Reasoning

2. English Aptitude

- Fill in the blanks
- Comprehension
- Odd man out
- Phrases and Sentences
- Sequencing
- Basic Grammar
- Meanings

Outcomes:

- The student will be able to • Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.
- " The main aim of introducing "Quantitative Aptitude"for mathematics students is to develop skill to meet the competitive examinations for better job opportunity.
- "
- Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.
- Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.
- This course consists of practice exercises for Quantitative or Numerical and Verbal Ability. Prepare for Aptitude Tests for Entrance Exams like GATE, CAT, Bank PO, SAT, GMAT, GRE, UPSC and RRB.

Course Code	Course Title	L	P	T	C
201ACSSIST	Interview Skills Training and Mock Test				

Aim:

➤ Exclusive Pre-Placement Training – both General Aptitude and Technical Aptitude is carried out by External Training firms, Corporate Professionals for final year students.- with a focus on the Corporate Selection Process during the Campus Hiring Visit

➤ Mock Tests on Company Specific Aptitude Question papers are carried out along with Mock Interviews. Based on such companies face-to-face- Technical & HR – interviewing style and finally placement offer provide to the students.

Course Outcomes:

- Help candidates reduce their stress and anxiety before a real job interview.
- Help you boost your confidence.
- Provide you with useful feedback in a low-stress environment.
- Help you prepare for behavioral-based interview questions.
- Interviewing Skills Training focuses on the skills required to conduct engaging interviews that include effective questions.
- This will allow a hiring manager or interviewer to ensure the best practices are followed to hire the right candidates with the applicable skills, behavior, and mindset.

EMPLOYABILITY,/SKILL DEVELOPMENT

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B.Sc.,(IT) curriculum, the following Research Skill Based Courses are introduced in the B.Sc.,(IT) curriculum.

Semester	RSB Courses	Credits
II	Research Led Seminar	1
III	Research Methodology	2
V	Participation in Bounded Research	1
VI	Project Work	4

Blueprint for assessment of student's performance in Research Led Seminar Course

<input type="checkbox"/>	Internal Assessment:	40 Marks
<input type="checkbox"/>	Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks	
<input type="checkbox"/>	Seminar Review Presentation : 10 Marks	
<input type="checkbox"/>	Literature Survey : 10 Marks	
<input type="checkbox"/>	Semester Examination :	60
	Marks	

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment:	20 Marks
<input type="checkbox"/> Research Tools(Lab) :	10 Marks
<input type="checkbox"/> Tutorial:	10 Marks
Model Paper Writing:	40 Marks
● Abstract:	5 Marks
● Introduction:	10 Marks
● Discussion:	10 Marks
● Review of Literature:	5 Marks
● Presentation:	10 Marks
Semester Examination:	40 Marks
Total:	100 Marks

Course Code	Course Title	L	T	P	C
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20122DSC63A	Software Project management	4	1	0	3
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UNIT I INTRODUCTION TO PROJECT MANAGEMENT

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT III ACTIVITY PLANNING

Objectives – Project Schedule – Sequencing And Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity On Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT IV MONITORING AND CONTROL

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS

Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman–Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

Course Outcomes:

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics in successful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

REFERENCES:

1. Bob Hughes and MikeCotterell “Software Project Management”, Third Edition, TATA McGraw Hill Edition 2004.
2. Ramesh, Gopaldaswamy: "Managing Global Projects ", Tata McGraw Hill, 2001.
3. Royce.” Software Project Theory”, Pearson Education, 1999.
4. P.Jalote “Software Project Management In Practice”, Pearson Education, 2000.

EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT



SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
BCA (BACHLOR OF COMPUTER APPLICATION)
REGULATION 2020
COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami – I/ Advanced English-I /Hindi-I/ French – I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20122SEC13	Programming in C with C++	5	1	0	4
20112AEC14B	Classical algebra	4	1	0	3
20112AEC15B	Numerical and statistical Methods	4	1	0	4
PRACTICAL					
20122SEC16L	Programming in C with C++ Lab	0	0	3	2
	Total	21	3	3	17
AUDIT COURSE					
201LSCIC	Indian Constitution	-	-	-	2

201LSCUV	Universal Human Values	-	-	-	2
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SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil – II/ Advanced English-II /Hindi-II/ French – II	4	0	0	2
20111AEC22	English-II	4	0	0	2
20122SEC23	Data Structure and Algorithms	5	1	0	4
20112AEC24B	Discrete Mathematics	4	1	0	4
20112AEC25B	Operations Research	4	1	0	3
PRACTICAL					
20122SEC26L	Data Structure and Algorithms Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20122RLC27	Research Led Seminar	-	-	-	1
	Total	21	3	3	18
AUDIT COURSES					
201LSCCS	Communication Skills	-	-	-	2

201SSCBE	Basic Behavioral Etiquette	-	-	-	2
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SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil – III/Hindi-III/ Advanced English-III / French – III	4	0	0	2
20111AEC32	English-III	4	0	0	2
20122SEC33	Internet and Java Programming	4	1	0	4
20161SEC34	Financial Accounting	4	1	0	4
20113AEC35A	Allied Physics –I	3	1	0	3
PRACTICAL					
20122SEC36L	Internet and Java Programming Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20120RMC37	Research Methodology	2	0	0	2

	Total	21	3	3	19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 19135AEC41	Tamil-IV/ Advanced English-IV /Hindi-IV/ French – IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20122SEC43	Visual Programming	4	1	0	4
20113AEC44A	Allied Physics –II	5	1	0	5
201ENSTU45	Environmental Studies	2	0	0	2
PRACTICAL					
20122SEC46L	Visual Programming Lab	0	0	3	2
20113AEC47AL	Allied Physics Lab –I	0	0	3	2
	Total	19	2	6	19

AUDIT COURSE					
201LSCLS	Leadership and Management Skills	-	-	-	2
201SSCAQ	General Aptitude and Quantitative Ability				2

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
20122SEC51	Relational Database Management Systems	4	1	0	4
20122SEC52	.NET Programming	4	1	0	3
20122SEC53	Designing and supporting Computer Networks	4	1	0	4
20122DSC54_	Discipline Specific Elective -I	4	1	0	3
PRACTICAL					
20122SEC55L	Oracle Lab	0	0	3	2
20122SEC56L	.NET Programming Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20122BRC57	Participation in Bounded Research	-	-	-	1

	Total	16	4	6	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2

SEMESTER – VI

Course Code	Course Title	L	T	P	C
THEORY					
20122SEC61	Advanced Web Technology	4	1	0	4
20122SEC62	Operating System	4	1	0	5
20122DSC63_	Discipline Specific Elective –II	4	1	0	3
201__OEC(2 Digit Course Name)	Open Elective	4	0	0	2
PRACTICAL					
20122SEC64L	Advanced Web Technology Lab	0	0	3	2

20122SEC65L	Operating System Lab	0	0	3	2
20122PRW66	Project Work	-	-	-	4
20122PROEE	Program Exit Examination	-	-	-	1
	Total	16	3	6	23
AUDIT COURSE					
201SSCIM	Interview Skills Training and Mock Test	-	-	-	2
201LSCCE	Community Engagement	-	-	-	1
Total Credits –Programme					115
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
V	a) 20122DSC54A- Computer Organization and Architecture b) 20122DSC54B - E-learning
VI	a) 20122DSC63A- Software Project Management b) 20122DSC63B - Object Oriented Analysis and Design

Open Electives

Semester	Open Elective Courses
VI	a) 201TAOEC-Tamil IlakkiyaVaralaru b) 201ENOEC- Journalism c) 201MAOEC-Development of Mathematical Skills d) 201PHOEC-Instrumentation e) 201CHOEC-Food and Adulteration f) 201MBOEC-Wildlife Conservation g) 201CSOEC-E-Learning h) 201CMOEC-Banking Service

GRADUATE ATTRIBUTES :

- Information Literacy
- Problem Analysis
- Design/development of solutions
- Modern tool usage
- Professional and Ethical understanding

PROGRAMME OBJECTIVES:

- Be exposed to the syntax of C.
- Be Familiar with the Basics of C Programming Language.
- To study about Graphics programming using java Language
- Design and implement reliable and maintainable object-oriented applications of moderate complexity composed of several classes
- To learn the basic principles of database and database design
- To understand computational development of graphics with mathematics

PROGRAMME OUTCOMES (O₁):

- Able to understand and design the solution to a problem using object-oriented programming concepts
- Trace the flow of information from one node to another node in the network
- Design Databases for applications.
- Able to Measure the product and process performance using various metrics

- Gain the knowledge of different media streams in multimedia transmission
- Apply the various optimization techniques.

COURSES (C₁):

- Core -I Programming in C with C++
- Core -II Data Structure and Algorithms
- Core -III Internet and Java Programming
- Core –IV Visual Programming
- Core –V Relational Database Management Systems
- Core –VI .NET Programming
- Core –VII Designing and supporting Computer Networks
- Core –VIII Advanced Web Technology
- Core –IX Operating System

CURRICULUM MAPPING

Outcomes

	O ₁	O ₂	O ₃	O ₄	O ₅	O ₆
C ₁	✓					
C ₂	✓		✓			
C ₃	✓		✓			
C ₄			✓			✓
C ₅		✓				
C ₆			✓	✓		✓
C ₇						✓
C _{8A}			✓			✓
C _{8B}					✓	✓
C ₉			✓		✓	

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

முதல் பருவம் - தாள் - I

இக்கால இலக்கியம், செய்யுள், சிறுகதை, இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி
அலகு - I

பாரதியார் தேசபக்திப் பாடல்கள்

சுதந்திரப் பெருமை

சுதந்திரப் பயிர்

சுதந்திர தேவியின் துதி

தொண்டு செய்யும் அடிமை

பாரதிதாசன்

விரத்தாய்

அலகு - II

சுரதா - நல்ல தீர்ப்பு

கண்ணதாசன் - கந்தல் துணியின் கதை

பட்டுக்கோட்டை கல்யாணசுந்தரம் - நண்டு செய்த தொண்டு - காலம் சரியில்லே

முடிமத்தா - வாழையடி வாழை

வாலி - தாய்

அலகு - III

சிறுகதை - இளவேனிற் குறிப்புகள் - திருவையாறு பாலகுமார்

அலகு - IV

இலக்கணம்

எழுத்து

மனப்பாடப்பகுதி

அலகு - V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை,புதுக்கவிதை

தாள் - I

ஒப்படைவு - மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை - 20 மதிப்பெண்

ஆத்திச்சூடி - 20 மதிப்பெண்

அறம் செய விரும்பு, ஆறுவது சினம், இயல்வது கரவேல், ஈவது விலக்கேல், உடையது விளம்பேல், ஊக்கமது கைவிடேல், எண் எழுத்து இகழேல்,ஏற்பது இகழ்ச்சி, ஐயம் இட்டு உண், ஒப்புரவு ஒழுது, ஒதுவது ஒழியேல்,ஒளவியம் பேசேல், கண்டு ஒன்று சொல்லேல், ஞயம்பட உரை, இடம்பட வீடு எடேல், இணக்கம் அறிந்து இணங்கு, தந்தை தாய்ப்பேன்,நன்றி மறவேல்,பருவத்தீத பயிர்செய், இயல்பு அலாதன செயேல்,வஞ்சகம் பேசேல்,இளமையில் கல்,அனந்தல் ஆடேல்,கடிவது

மற,கீழ்மை அகற்று,குணமது கைவிடேல்,கெடுப்பது ஒழி, கேள்வி முயல்,சான்றோர் இனத்து இரு, சோம்பித்திரியேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

Course Outcome:

- Learn the changes occurred in literature since classical period.
- Make use of vocabulary systematically.
- Obtaining More information about one's culture and tradition;
- Encourage creative writing and developing self-confidence.
- Aiming at enriching human excellence;
- Increasing the level of comprehension and exercising communal harmony

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people: Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing Proof reading

UNIT – V

Comparison and contrast

Cause and effect

SKILL DEVELOPMENT

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Essentials of Business Communication

-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons

English for writers and translators

-Robin Macpherson

Technical Communication

-Meenakshi Sharma & Sangeetha Sharma

The World's Great Speeches
English Work Book-I&II

- Sudhir Kumar Sharma Galaxy Publishers
-Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

AIM:

To acquaint students with learning English through literature

OBJECTIVE:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

OUTCOME:

- Read and comprehend literature

UNIT –I

The Art of Reading - Lin Yutang
 An Eco-Feminist Vision -Aruna Gnanadason

UNIT – II

The Merchant of Death -Nanda Kishore Mishra & John Kennet
 She Spoke for all Nature -Young world 'The Hindu'

UNIT –III

Because I could not Stop for Death -Emily Dickinson
 Stopping by Woods on a Snowy Evening -Robert Frost

UNIT –IV

Enterprise -Nissim Ezekiel
 Love poem for a wife -A.K Ramanujam

UNIT –V

Oliver Twist -Charles Dickens

EMPLOYABILITY

REFERENCES:-

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan
 Emerald Publishers

Course Code	Course Title	L	T	P	C
20122SEC13	Programming in C with C++	5	1	0	4

AIM

To equip the students with fundamental programming principles and concepts of object oriented design.

OBJECTIVES:

The students should be made to:

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.
- To learn how C++ supports Object Oriented principles such as abstraction, polymorphism etc
- To understand and apply the principles hiding, localization and modularity in software
- Design and implement reliable and maintainable object-oriented applications of moderate complexity composed of several classes

UNIT -I

Introduction - Basic Structure of C Programs - Character set -C Tokens - Constants - Variables-Data Types - Declaration and Assigning Values to Variables - Defining Symbolic Constants - Operators - Expressions - Type conversions - Built-in functions.

UNIT -II

Managing Input and Output Operators - Decision Making and Branching - Decision Making and Looping – Arrays and its Types.

UNIT –III

Functions: The Form of C Functions-Return Values and Their Types -Calling a Function- Category of Functions- Nesting of Functions-Recursion- Structures and Unions-Pointers.

UNIT-IV

Basic concepts of OOPs- Benefits and Application of OOPs- Inline functions- Function overloading – Friend and Virtual Functions -Constructors and Destructors - Operator overloading.

UNIT-V

Inheritance and its Types- Files - Classes for file stream operations - Opening, Closing and processing files - End of file Detection - File Pointers - Updating a file - Error handling during file operations - Command Line Arguments - Templates - Exception Handling.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications
- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to demonstrate the use of virtual functions to implement polymorphism.
- Understand functions and parameter passing.
- Be able to do numeric (algebraic) and string-based computation.
- Understand object-oriented design and programming

REFERENCE BOOKS:

1. “Programming in C” – E. Balagurusamy – Tata McGraw-Hill Publications
2. “Programming with C” – Byron S.Gottfried – Schaum’s outline series – Tata McGraw-Hill publications.
3. "Object oriented programming with C++". E. Balagurusamy, Tata McGraw Hill Publishing ltd., New Delhi, 1995.
4. “C++ The complete reference”- Herbert Schilt, 3rd edition, Tata McGraw Hill Pub-Ltd., 1999

Course code	Course Title	L	T	P	C
20112AEC14B	Classical Algebra	4	1	0	3

OBJECTIVES:

To learn about the expansion of a Binomial Theorem for a rational index using vandermonde's theorem. Further we aim at learning problems to be solved using the different types in Binomial series .Understanding the relation between roots and coefficients of polynomial equations-symmetric functions-sum of r^{th} power of the roots-two methods And Reciprocal equations-Descartes' rule of signs-simple problems.

UNIT-I

Binomial, exponential and logarithmic series (formulae only)-Summations.

UNIT-II

Non singular, symmetric, skew symmetric orthogonal, Hermition, skew Hermition and unitary matrices-characteristic equation, Eigen values, Eigen vector-Cayley Hamilton's theorem(proof not needed)-simple applications.

UNIT-III

Relation between roots and coefficients of polynomial equations-symmetric functions-sum of r^{th} power of the roots-two methods.

UNIT-IV

Transformation of equations-diminishing, increasing and multiplying the roots by a constant-forming equation with the given roots.

UNIT-V

Reciprocal equations-Descartes' rule of signs-simple problems.

EMPLOYABILITY

LEARNING OUTCOMES

By the end of this course, you should:

- Understand the theory of, and be able to solve problems in Cayley Hamilton Theorem, and finding the Eigen values & Eigen vectors
- be able to manipulate relation between root and coefficients, symmetric functions of the roots in terms of the coefficients and transformation of equation .
- be able to calculate summation related to Binomial, Exponential and Logarithmic series

REFERENCE BOOKS:

Algebra-T.K.M.Pillai, Vol1&2.

Course code	Course Title	L	T	P	C
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20112AEC15B	Numerical And Statistical Methods	4	1	0	4
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OBJECTIVES:

The roll of numerical analysis is to develop and analyze the numerical techniques. In this paper, different methods for finding the roots of algebraic and transcendental equations, solutions of simultaneous equations, solutions of ordinary differential equations Solution of Linear systems, Numerical differentiation and integration interpolation with equal & unequal intervals are concentrated. Correlation coefficient and its properties Linear Regression and its properties, Test of significance would also be taught.

UNIT-I

Algebraic and transcendental equations-the iteration method –the Newton Raphson method-False Position method-the bisection method

UNIT-II

Interpolation-Finite difference –Newton’s formulae for interpolation-Lagrange’s formulae for interpolation-Gaussian elimination method –Gauss-Seidal method.

UNIT-III

Numerical different ion and integration-Maximum and minimum values of a tabulated functions-Trapezoidal rule-Simpson’s rule –Numerical solution of ordinary differential equations-Euler’s method –Runge Kutta methods-Predictor corrector method-Boundary value problems.

UNIT-IV

Correlation –different types of correlation –Karl Pearson’s spearman’s correlation-Regression-Regression coefficients-Regression equations-Properties of correlation and regression coefficients.

UNIT-V

Test of hypothesis-null and alternative hypothesis-tests of significance based on normal and distribution for mean, simple correlation and proportion Chi square test-independents of attributes and goodness of fit-applications.

EMPLOYABILITY

Learning outcomes

By the end of this course, you should be able to calculate the solution of algebraic and transcendental equations.

- solutions of simultaneous equations, be able to calculate the area of the given curve
- Understood the concept of correlation and regression
- A knowledge of test of significance based on parametric and non – parametric test

REFERENCE BOOKS:

1. Introductory methods of numerical analysis S.S.Sastry, PHI
2. Fundamentals of mathematical statistics-S>C>Gupta & V.K.Kapoor.

Course Code	Course Title	L	T	P	C
20122SEC16L	Programming in C with C++ Lab	0	0	3	2

1. Solution of a Quadratic Equation (all cases).
2. Sum of Series (Sine, Cosine, e^x)
3. Ascending and descending order of number using Arrays (Use it to find largest and smallest numbers).
4. Sorting of names in Alphabetical order.
5. Write a c program for Matrix Operations (Addition, Subtraction, Multiplication- use functions).
6. Write C++ program using a class to represent a bank account with data members- name of depositor, account number, type of account, balance and member functions - deposit amount, withdraw amount, show Name and balance. Check the program with your own data.
7. Write C++ programs for implementing inheritance.
8. Write a C++ program using friend function.
9. Write a C++ program which reads a text from a file and the display the following information (Number of Lines, Number of words, and Number of characters).

10. File Processing: Mark sheet preparation.

SKILL DEVELOPMENT

Course Outcome:

- Read understand and trace the execution of programs written in C language.
- Write the C code for a given algorithm.
- Implement programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.
- Illustrate flowchart and algorithm to the given problem.
- Understand basic Structure of the C-Programming ,declaration and usage of variables

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	-

OBJECTIVES:

- To make the students understand about the Democratic Rule and Parliamentary Administration.
- To appreciate the salient features of the Indian Constitution.
- To know the fundamental Rights and Constitutional Remedies.
- To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
- To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

UNIT I: THE MAKING OF INDIAN CONSTITUTION

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: FUNDAMENTAL RIGHTS AND FUNDAMENTAL DUTIES OF THE CITIZENS

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties .

UNIT III: DIRECTIVE PRINCIPLES OF STATE POLICY

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: THE UNION EXECUTIVE, UNION PARLIAMENT AND SUPREME COURT

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister Rajya Sabha- Lok Sabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

**UNIT V: STATE COUNCIL – ELECTION SYSTEM AND PARLIAMENTARY
DEMOCRACY IN INDIA**

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

SKILL DEVELOPMENT

OUTCOMES

1. Democratic values and citizenship Training are gained.
2. Awareness on Fundamental Rights are established.
3. The functions of union Government and State Governments are learnt.
4. The power and functions of the Judiciary learnt thoroughly.
5. Appreciation of Democratic parliamentary Rule is learnt.

REFERENCE BOOKS:

1. Palekar S.A. Indian Constitution Government and politics, ABD Publications, India.
2. Aiyer Alladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. Kashyap Subash C Our Parliament, National Book, Trust New Delhi 1989.

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Casestudies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will

learners lose if they don't practice it?

- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Casestudies

Unit VI

• Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.

- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore

• Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?

- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Casestudies

Unit VII

• Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and Ways of overcoming greed. Renunciation with action as true renunciation

• Individuals who are remembered in history for practicing this value.

• Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.

• Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?

- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Course Code	Course Title	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

தாள் - II

செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறுமனப்பாடப்பகுதி

அலகு-I

திருஞானசம்பந்தர் தேவாரம் -இடரினும் தளரினும் - பதிகம்
 திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை - பதிகம்
 திருவாசகம் - கோயிறு திருப்பதிகம்
 திருமந்திரம் - 25, 85, 139,238,250,252,270,724,2104,2716
 திருஅருட்பா - தெய்வமணி மாலை 1,8,9

அலகு-II

நம்மாழ்வார் - 1 பாசரம்- திருவாய்மொழி -எம்பெருமானுக்கு ஆட்படுதல் இன்பமே
 பெரியாழ்வார் - 1 பாசரம் - திருப்பல்லாண்டு - தாலப்பருவம்
 நரசிபார் திருமொழி -10 பாடல்கள்- ஆறாம் திருமொழி

அலகு-III

சிற்றிலக்கியம் , முக்கூடற்பள்ளு வளமை, செழுமை
 மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ் தாலப்பருவம்-ஐந்துபாடல்கள்

அலகு-IV

இலக்கணம்

சொல்

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

சைவ, வைணவ இலக்கியங்கள்

சிற்றிலக்கியப்பள்ளு

பிள்ளைத்தமிழ்

பரணி

தாள் II

ஒப்படைவு - மதிப்பெண் 40 பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண் கொன்றை வேந்தன் 20 மதிப்பெண்

அன்னையும் பிதாவும் முன்னறி தெய்வம், இல்லறம் அல்லது நல்லறம் அன்று, ஊருடன் பகைக்கின் வேருடன் கெடும்,ஏவா மக்கள் மூவா மருந்து,ஒளவியம் பேசுதல் ஆக்கத்திற்கு அழிவு, அட்கமும் காசும் சிக்கனத்தோடு,கற்பெனப்படுவது சொல்திறம்பாமை,கிட்டாதாயின் வெட்டென மற,கீழோர் ஆயினும் தாழ உரை,குற்றம் பார்க்கின் சுற்றம் இல்லை, கூர் அம்பு ஆயினும் வீரியம் பேசேல், கெடுவது செய்யின் விடுவது கருமம், கைப்பொருள் தன்னின்,மெய்ப்பொருள் கல்வி,சீரைத்தேடின ஏரைத்தேடு, சுற்றத்திற்கு அழகு சூழ இருத்தல்,சூதும் வாதும வேதனை செய்யும்,சேமம்புகினும் யாமத்து உறங்கு, சோம்பர் என்பவர் தேம்பித்திரிவர், தந்தை சொல்மிக்க மந்திரம் இல்லை, தாயிற் சிறந்தது ஒரு கோவிலும் இல்லை, திரைகடல் ஓடியும் திரவியம் தேடு, தீராக் கோபம் போராய் முடியும், தோழனோடும் ஏழமை பேசேல்,நாடெங்கும் வாழக் கேடொன்றும் இல்லை,நீரகம் பொருந்திய ஊரகத்து இரு, பாலோடு ஆயினும் காலம் அறிந்து உண், பையச் சென்றால் வையம் தாங்கும், மருந்தே ஆயினும் விருந்தோடு உண், முற்பகல் செய்யின் பிற்பகல் விளையும், மேழிச் செல்வம் கோழைபடாது,(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு

கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT –I

E-mail, Fax, Memos

UNIT – II

Itinerary, Checklist

UNIT – III

Invitation, Circular

UNIT – IV

Instruction, Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

EMPLOYABILITY

References:

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Inspiring Lives	-Maruthi Publishers
English Work Book-I&II	-Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

AIM:

To acquaint learners with different trends of writing

OBJECTIVE:

- To empower students to acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

OUTCOME:

- Read and comprehend literature
- Read and appreciate literature
- Know more about Mahatma Gandhi, Mother Teresa, Martin Luther King

UNIT – I

Ecology	-A.K. Ramanujan
Gift	-Alice Walker
The First Meeting	-Sujata Bhatt

UNIT –II

Fueled	-Marcie Hans
Asleep	-Ernst Jandl
Buying and selling	-Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood	- E.M.Forster
The Meeting of Races	- Rabindranath Tagore

UNIT – IV

The Refugee	-K.A. Abbas
I Have a Dream	-Martin Luther king
Those People Next Door	-A.G. Gardiner

UNIT – V

Marriage is a private Affair	-Chinua Achebe
The Fortune Teller	-Karel Capek
Proposal	-Anton Chekov

SKILL DEVELOPMENT

REFERENCES:-

Course Code	Course Title	L	T	P	C
20122SEC23	Data Structure and Algorithms	5	1	0	4

AIM

To equip the students with principles data structure concepts and algorithms.

OBJECTIVES:

The Student Should Be Made To:

- Be Familiar with the Basics of C Programming Language.
- Be Exposed To The Concepts Of Adts
- Learn Linear Data Structures – List, Stack, And Queue.
- Be Exposed To Sorting, Searching, Hashing Algorithms

UNIT –I

Arrays and sequential Representations - Ordered Lists - stacks and Queues- Evaluation of expressions - Multiple stacks and queues - Singly Linked lists - linked stacks and queues - polynomial addition - doubly linked lists and dynamic storage management - strings.

UNIT-II

Trees - binary tree representations - Tree traversal - Threaded binary trees - binary tree representation of trees - set representations -decision trees - games trees and counting binary trees -graphs and representations traversals, connected components and spanning trees shortest paths and transitive closure - activity networks - topological sort and critical paths.

UNIT-III

Algorithms - conventions - Writing structured programs - Analyzing algorithms - sorting heap sort - binary search - finding the maximum and minimum – merge sort – quick sort - selection sort

UNIT-IV

Greedy method: The general method - optimal storage on tapes knapsack problem - job sequencing with deadlines - optimal merge patterns - minimum spanning trees-single source shortest paths.

UNIT-V

Backtracking : The general method - the 8 queens problem - sum of subsets - graph coloring - Hamiltonian cycles - knapsack problem. BRANCH AND BOUND: The general method - 0/1 knapsack problem - Traveling salesperson - Efficiency considerations.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Use the control structures of C appropriately for problems.
- Apply the different linear data structures to problem solutions.
- Critically analyze the various algorithms.

REFERENCE BOOKS:

1. Fundamental of Data Structure - Ellis Horowitz and Sartaj Sahni.
Chapters 2,3,4,5 only (Excluding 2.3,3.2,4.5,4.6,4.7,4.10,4.12,6.5)
2. Fundamental of computer algorithms - Ellis Horowitz and sartaj Sahni
Galgotia Publications.
3. Data Structures - LIPSCHUTA, Tata MaGrawHill, Schaum's Outline series.

Course code	Course Title	L	T	P	C
20112AEC24B	Discrete Mathematics	4	1	0	4

OBJECTIVES:

Algebraic structures like Groups ,cosets , different types of morphisms of groups fundamental them of homomorphism are concentrated. Graph Theory is an integral part of Discrete Mathematics. It has applications to many fields, including computer science, physics, chemistry, psychology and sociology. In this course we teach basic topics in graph theory 20 such as Trees, Directed graphs, Connectivity, Euler tours are also concentrated

UNIT I

Groups- Types – Propertices Of Groups- Semi Groups-Monoids – Problem In Groups- Cyclic Groups And Subgroups

UNIT-II

cosets & lagrange’s thm-Normal groups and quotient groups- Different types of morphisms of groups fundamental thm of homomorphism.

UNIT III

Graph theory - Basic concepts- Finite and infinite graph – Incidence and degree ideas on vertices- Isomorphism-sub graphs – Walks – Paths and circuits

UNIT IV

Connected Graphs And Disconnected Graphs And Components - Euler Graphs – Hamiltonian Path And Circuits

UNIT V

Trees-properties of trees -pendent vertices – Distance and centers in a tree rooted and binary trees.

EMPLOYABILITY

Learning outcomes

By the end of this course, you should be able

- Understood the concept of Algebraic structures like Groups ,cosets , different types of morphisms of groups fundamental theorem of homomorphism
- Knowledge in Graph Theory
- Understood the properties of Graph Theory
- Understood the concept of Euler theorem and its applications

REFERENCE BOOKS:

1. Algebra - Arumugan Issac
2. Graph theory – Narasingh deo

Course Code	Course Title	L	T	P	C
20112AEC25B	Operations Research	4	1	0	3

OBJECTIVES:

Optimization is an important tool of modern applied mathematics. This course gives an idea to the student to recognize potential linear programming problems, to formulate such problems as linear programming models, to employ the proper computational techniques to solve these problems, and to understand the mathematical aspects that tie together these elements of linear programming. The objective of this paper is to highlight the theoretical, computational and applied aspects of linear programming problems.

UNIT — I

Basic of operations research (OR) characteristics of OR - Necessity of OR in industry, OR and decision making - role of computers in OR Linear Programming: Formulations and graphical solution of (2 variable) canonical and standard terms of linear programming problem.

UNIT — II

Algebraic Solution: Simplex methods — Charnes method of penalty - Two phase simplex method.

UNIT — III

Transportation Model: Definition — Formulation and solution of transportation models the row — Minima, column minima, Matrix minima and Vogel's approximation method. Assignment Model: Definition of assignment model— comparison with transportation model - Formulation and solution of assignment model

UNIT — IV

Sequencing problem: Processing of n jobs through 2 machines - processing n jobs through 3 machines - processing 2 jobs through m machine Games Theory: Characteristics of games — Maximin, Minmax, criteria of optimality — Dominance property - Algebraic and graphical method of solution of solving 2 x 2 games

.UNIT — V

PERT computation — Resource scheduling.

EMPLOYABILITY

Learning outcomes

By the end of this course,

- Students using OR techniques in business tools for decision making
- Students develop PERT and CPM networks and finding the shortest path
- Understand the concept of sequencing problems and game theory
- Students get the knowledge about inventory theory

REFERENCE BOOKS:

1. Hamdy A. Taha: Operation Research - An Introduction 5th Edition, PHI, New Delhi 1996
2. Ackoff, R Land Sasieni, M.N: Fundamental of Operation research, John Wiley and sons, New York 1968.

Course Code	Course Title	L	T	P	C
20122SEC26L	Data Structure and Algorithms Lab	0	0	3	2

1. SORTING:

- a. Bubble sort
- b. Heap sort
- c. Insertion Sort

2. **SEARCHING:**

- a. Linear search
- b. Binary search

3. Operations on Stack
4. Operations on Queue
5. Operations on single Linked list
6. Operations on doubly linked list
7. Binary Tree Traversal

EMPLOYABILITY

Course Outcome:

- Implement basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph Traversals and Shortest Paths.
- Implement various searching and sorting algorithms.
- To develop application using data structure algorithms.
- Implement the concept of data structures through ADT including List,Stack,Queues.
- Apply Algorithm for solving problems like sorting,searching,insertion and deletion of data

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Aim:

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
- i. Identify the main claim of the text
- ii. Identify the purpose of the text
- iii. Identify the context of the text
- iv. Identify the concepts mentioned

- Evaluating these ideas and information
- i. Identify the arguments employed in the text
- ii. Identify the theories employed or assumed in the text
- Interpret the text
- i. To understand what a text says
- ii. To understand what a text does
- iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
- i. Well-knit logical sequence
- ii. Narrative sequence
- iii. Category groupings
- Different modes of Writing -
- i. E-mails
- ii. Proposal writing for Higher Studies
- iii. Recording the proceedings of meetings
- iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tool
- Office
- Excel
- Powerpoint

Unit VI

- Introduction to social mediawebsites
- Advantages of socialmedia
- Ethics and etiquettes of socialmedia
- How to use Google searchbetter
- Effective ways of using SocialMedia
- Introduction to DigitalMarketing

Unit VII

- Meaning of non-verbalcommunication
- Introduction to modes of non-verbalcommunication
- Breaking the misbeliefs
- Open and Closed Bodylanguage
- Eye Contact and FacialExpression
- HandGestures
- Do's andDon'ts
- Learning fromexperts
- Activities-BasedLearning

SKILL DEVELOPMENT

Reference:

- 1 SenMadhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
- 2 Silvia P.J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

Course Code	Course Title	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

தாள் - III

செய்யுள் - காப்பியங்கள், இலக்கணம்,இலக்கிய வரலாறு, மனப்பாடப்பகுதி

அலகு-I

சிலப்பதிகாரம்-வழக்குரை காதை மணிமேகலை-ஆதிரை பிச்சையிட்ட காதை
சீவகசிந்தாமணி-நாட்டுவளம் 10 பாடல்கள்

அலகு-II

பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம். கம்பராமாயணம்-வாலி வதைப்படலம்

அலகு-III

சீராப்புராணம் - கரம் பொருத்து படலம். இயேசுகாவியம் - மழைப்பொழிவு

அலகு-IV

இலக்கணம்

யாப்பு

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

காப்பியங்கள்

ஐஞ்சிறுகாப்பியங்கள்

புராணங்கள், இதிகாசங்கள்

தாள் - III

ஒப்படைவு - மதிப்பெண் 40

பாடத்தொடர்புடையக் கட்டுரை 20 மதிப்பெண்

வேற்றி வேற்கை 20 மதிப்பெண்

எழுத்து அறிவித்தவன் இறைவன் ஆதும், கவ்விக்கு அழகு கசடற மொழிதல், செல்வர்க்கு அழகு செழுங்கிளை தாங்குதல், மன்னவர்க்கு அழகு செங்கோல் முறைமை, வைசியர்க்கு அழகு வளர் பொருள் ஈட்டல், உழவர்க்கு அழகு உழுது ஊண் விரும்பல், மந்திரிக்கு அழகு வரும் பொருள் உரைத்தல், தந்திரிக்கு அழகு தறுகண் ஆண்மை, உண்டிக்கு அழகு விருந்தோடு உண்டல், பெண்டிர்க்கு அழகு எதிர் பேசாதிருத்தல்,அறிஞர்க்கு அழகு கற்றுணர்ந்து அடங்கல், வறிஞர்க்கு அழகு வறுமையில் செம்மை, பெரியோர் எல்லாம் பெரியோரும் அல்லர்,சிறியோர் எல்லாம் சிறியரும் அல்லர்,அடினும் ஆவின் பால் தன் சுவை குன்றாது, சுடினும் செம்பொன் தன்னொளி கெடாது, அறைக்கினும் சந்தனம் தன் மனம் மாறாது பெருமையும் சிறுமையும் தான் தர வருமே, அறிவுடை ஒருவனை அரசும் விரும்பு, யானைக்கு இல்லை தானமும், தருமமும்,பூனைக்கு இல்லை தவமும் தயையும், ஞானிக்கு இல்லை இன்பமும் துன்பமும் , அச்சமும் நாணமும் அறிவிலோருக்கு இல்லை, நாளும் கிழமையும் நலிந்தோருக்கு இல்லை, கேளும் கிளையும் கெட்டோருக்கு இல்லை,உடைமையும் வறுமையும் ஒரு வழி நிலலாஇரந்தோர்க்கு ஈவதும்

உடையோர் கடனே,பழியா வருவது மொழியாது ஒழிவது, சுழியா வருபுனல் இழியாது ஒழிவது, துணையோடு அல்லது நெடுவழி போகேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

Course Code	COURSE TITLE	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech, Classification of speech sounds , Vowels and Diphthongs

UNIT –II

Consonants, Consonant cluster

UNIT – III

Syllable, Word accent, Intonation

UNIT – IV

Idiom, Interpretation of graphics

UNIT – V

Slogan writing, Writing advertisement

UNIT – V

Slogan writing, Writing advertisement

SKILL DEVELOPMENT

References:

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
A text book of Phonetics for Indian Students	-T.B. Balasubramaniyan

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

AIM:

To acquaint students with learning English through literature

OBJECTIVE:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

OUTCOME:

- Read and comprehend literature

UNIT – 1

The Doctor's World	- R.K. Narayan
The Postmaster	- Rabindranath Tagore
Princess September	- E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	- Norah Burke
Uneasy Home Coming	- Will F. Jenkins

Resignation - Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

SKILL DEVELOPMENT**REFERENCES:-**

Nine Short Stories	-Steuart H.King Blackie Books
One-Act plays of Today	-T.Prabhakar Emerald Publishers

Course Code	Course Title	L	T	P	C
20122SEC33	Internet and Java Programming	4	1	0	4

AIM

To equip the students with basic programming skill in Java

OBJECTIVE

- To understand the core principles of the Java Language
- To study about Graphics programming using java Language
- To learn visual tools to produce well designed, effective applications and applets.

UNIT-I

Introduction to the Internet - Internet Technologies - Internet Browsers

UNIT-II

Decision making and looping statements -Classes, Objects and Methods

UNIT-III

Arrays, strings and vectors- Interfaces: Multiple Inheritance – Packages: Putting classes together
- Multithreaded Programming

UNIT-IV

Managing Errors and Exceptions - Applet programming- Graphics programming

UNIT-V

Managing Input/Output files in Java

EMPLOYABILITY

OUTCOMES:

- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

REFERENCE BOOKS:

1. “World Wide Web Design with HTML”, C.Xavier, Tata McGraw-Hill Publishing Company Limited for Unit-1.
2. “Programming with Java”, E.Balagurusamy, Tata McGraw-Hill Publishing Company Limited for Unit-2, 3, 4, 5.

Course Code	Course Title	L	T	P	C
20161SEC34	Financial Accounting	4	1	0	4

AIM:

To train the students to record all business events as per standard principles and established conventions.

OBJECTIVES:

- To ascertain whether the business operations have been profitable or not
- To assess the financial position of the business.
- To generate information.

UNIT – I

Meaning of Accounting- Meaning & objects of Book Keeping – Advantages of Accounting – Concepts and conventions – Principles of double entry – Kinds of accounts – Journal and ledger accounts.

UNIT – II

Subsidiary books – Advantages Subsidiary books - Purchases Book, Sales Book, Purchases returns Book, Sales returns Book, - Cash Book.

UNIT – III

Trial balance – Preparation - Rectification of errors –Bank Reconciliation Statement.

UNIT – IV

Final Accounts – Trading Accounts - Profit and Loss Accounts - Balance Sheet.

UNIT – V

Bills of Exchange – Single Entry System – Simple Problems.

EMPLOYABILITY**OUTCOMES:**

Students are now familiarizes with the accounting principles and practices and the ascertainment of the profitability and the financial position of the business.

REFERENCE BOOKS:

1. R.L.Gupta – Financial Accounting
2. S.P.Jain and K.L.Narang – Principles of Accounting
3. Readdy and Murthy – Financial Accounting
4. Dr.Radha - Financial Accounting

Course Code	Course Title	L	T	P	C
20113AEC35A	Allied Physics – I Electricity and Electronics	3	1	0	3

AIM:

To introduce the scientific principles relevant to electric circuits, and electronic devices.

OBJECTIVES:

Solve simple problems in basic electrical circuit theory. Analyse and predict the behaviour of simple logic circuits and electronic devices. To prepare the student for the study of physics by introducing general concepts and methods which will be applied throughout the course.

UNIT – I: CIRCUIT ELEMENTS:

Resistance in series and parallel – Capacitor in series and parallel – Conversion of galvanometer into voltmeter – Conversion of galvanometer into ammeter – Multimeter – CRO, AFO (Qualitative study only).

UNIT – II: ELECTRICITY:

Ohm's law – Kirchof's law – Wheatstone bridge – condition for bridge balance – Meter bridge – Specific resistance – Temperature co-efficient of resistance – Potentiometer – Measurement of current – voltage and resistance.

UNIT – III: SEMICONDUCTORS:

Conductors, Insulators, Semiconductors, P-type, N-type – semiconductors – PN-Junction diode – Zener diode – Static characteristics – Voltage regulation – Rectifiers: – Half wave rectifiers – Bridge Rectifiers – Calculation of ripple factor and efficiency.

UNIT – IV: BREAK DOWN DEVICES:

FET – Design of FET – FET characteristics – working of FET – SCR – Design – Characteristics – Triac – design and characteristics – Diac – design and characteristics.

UNIT – V: OPTO ELECTRONIC DEVICES:

LED – voltage and current – Advantages and applications of LED – LCD – Photo diode – its operation and application – Phototransistor – LED as Seven segment display.

EMPLOYABILITY

LEARNING OUTCOMES:

Learn how to develop and employ circuit models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors;

Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method;

REFERENCE BOOKS:

- 1) Electricity and Magnitism by Brijlal and Subramaniam.
- 2) Principles of electronics by V.K. Metha.

Course Code	Course Title	L	T	P	C
20122SEC36L	Internet and Java Programming Lab	0	0	3	2

1. Simple programming using for, while, do-while, ternary and switch.
2. String handling using string and string buffer.
3. Inheritance.
4. Polymorphism
5. Interfaces and Packages
6. Data files(creation, processing)
7. Vector manipulation
8. Simple programs using Applets
9. Exercises using predefined and user defined exceptions
10. Graphics programs for drawing lines, rectangle, oval, string using Applets.

EMPLOYABILITY

Course Outcome:

- To solve computational problems using basic constructs like if-else, control structures, array and strings.
- To implement relationships between classes.
- To evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.
- To develop software applications using java programming language.
- Write modular, multithreading and event driven programming
- Implement interfaces, inheritance, polymorphism, exception handling, file IO and multithreading as programming techniques for application development.

Course Code	Course Title	L	T	P	C
20120RMC37	Research Methodology	2	0	0	2

AIM:

To create a basic appreciation towards research process and awareness of various research publication.

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-based
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computation frame works used in mathematical researches.

PREREQUISITIES:

Basic computer skill for working in window environment & conceptual knowledge on basic matrices.

UNIT-I Introduction to Research Methodology

Meaning of research – Objectives of research – Type of research – Significance of research – Research approaches.

UNIT-II Research Methods

Research methods versus Methodology – Research and scientific method – criteria of good research – Problems encountered by researchers in India.

UNIT-III Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Review – General treatises – Monographs.

UNIT-IV Database Survey

Database search – NIST –MSDS –PubMed – Scopus – Science citation index – Information about a specific search.

UNIT-V Introduction to MATLAB:

What is MATLAB? Matrix and its application in different areas: MATLAB approach to environmental modeling; Arithmetic Matrix – Operators; Arithmetic Array – Operators and its applications in MATLAB; Expressions, Opening M-Files; Structure of MATLAB Programing; Programing; Concatenation of strings; Vectorization ; Basic Graphics.

EMPLOYABILITY

REFERENCE BOOKS:

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi,2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Aim:

Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

EMPLOYABILITY

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>

6. <https://wiki.openoffice.org/wiki/Documentation>

7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தாள் - IV

செய்யுள்- சங்க இலக்கியம், இலக்கணம்,இலக்கிய வரலாறு-மனப்பாடப் பகுதி

அலகு-I

எட்டுத்தொகை

நற்றினை – குறிஞ்சி 356,முல்லை-242, பாலை-397

குறுந்தொகை-2,18,25,58,67,69,135,167,283,373

ஐங்குறுநூறு சிறுவெண் காக்கைப் பத்து

அலகு-II

கலித்தொகை-பாலை 34,குறிஞ்சி-51,நெய்தல்-133

அகநானூறு - 36,147,332

புறநானூறு 34,173,189,235,279

அலகு-III

முல்லைப்பாட்டு

திருக்குறள்-ஐந்து அதிகாரம்- அறம் 2,பொருள் 2,இன்பம் -1

வான்சிறப்பு, அழகக்காறாமை, இறைமட்சி, கூடாநட்பு, காதற்சிறப்புரைத்தல்

அலகு-IV

இலக்கணம்

அணி

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

எட்டுத்தொகை

பத்துப்பாட்டு

அறஇலக்கியங்கள்

தாள் - IV

ஒப்படைவு மதிப்பெண்-40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண்

பாரதியார், பாரதிதாசன் புதிய ஆத்திச்சூடி 20 மதிப்பெண்

பாரதியார்

அச்சம் தவிர், ஆண்மை தவறேல், இளைத்தல் இகழ்ச்சி, உடலினை உறுதி செய், எண்ணுவது

உயர்வு, ஏறுபோல் நட, ஐம்பொறி ஆட்சி கொள், ஒற்றுமை வலிமையாம், காலம்

அழியேல், கீழோருக்கு அஞ்சேல், குன்றென நிமிர்ந்து நில், கொடுமையை எதிர்த்து நில், சிதையா

நெஞ்சு கொள், செய்வது துணிந்து செய், தீயோருக்கு அஞ்சேல், பெரிதினும் பெரிது

கேள், வையத்தலைமை கொள், யாரையும் மதித்து வாழ்

பாரதிதாசன்

காற்றினைத் தூய்மை செய்குற்ற நினைவு தீர்,தளையினைக் களைந்து வாழ் தூய நீராடு,
 தெருவெல்லாம் மரம் வளர்,தைக்க இனிதுரை,தொன்மை மாற்று,நினைவினில் தெளிவு கொள்,
 நீனிலம் உன் இல்லம்,போர்த் தொழில் பழகு,மாறுவது இயற்கை, வையம் வாழ வாழ்.
 (மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை)
 கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்

COURSE CODE	COURSE TITLE	L	T	P	C
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20111AEC41	Advanced English-IV	4	0	0	2
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Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

EMPLOYABILITY

References:

English Grammar

English Grammar and Composition

Essentials of Business Communication

Technical Communication

English for writers and translators

English Work Book-I&II

-Wren and Martin

-Radhakrishna Pillai

-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

-Meenakshi Sharma & Sangeetha Sharma

-Robin Macpherson

-Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

AIM:

To acquaint students with learning English through literature

OBJECTIVE:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

OUTCOME:

- Read and comprehend literature

UNIT –I

- How to be a Doctor -Stephen Leacock
My Visions for India -A.P.J. Abdul Kalam
Woman, not the weaker sex -M.K. Gandhi

UNIT –II

- My Last Duchess -Robert Browning
The Toys -Coventry Patmore
I, too -Langston Hughes

UNIT –III

- The Best Investment I ever made-A.J.Cronin
The Verger -W.S Maugham
A Willing Slave -R.K.Narayan

UNIT –IV

- Macbeth
As You Like It

UNIT –V

- Henry IV
Tempest

EMPLOYABILITY

REFERENCE BOOKS:-

- English for Enrichment -Devaraj Emerald Publishers
Selected Scenes from Shakespeare Book I &II -Emerald Publishers

Course Code	Course Title	L	T	P	C
20122SEC43	Visual Programming	4	1	0	4

AIM:

To equip the students with principles of various visual programming environment

OBJECTIVE:

- To learn the basic principles of visual programming
- To study the necessary skills to create software solutions using visual programming
- Understood the Open Data Base Connectivity using Visual programming.
- To inculcate knowledge on Programming and Project Development using Visual Basic.

UNIT I

Visual Basic – Integrated Development Environment (IDE) features – VB editor – customizing the IDE – anatomy of a form working with form properties – setting form’s properties – introducing form events and form methods.

UNIT II

Variables in Visual Basic : Declaring variables – Data types – Null values, Error value – empty value – the scope of a variable – Module level variable – Constants – Creating your own constants – Scope of a constant – Converting data types – arrays – Declaring arrays – Fixed size arrays – Dynamic arrays – Preserve keywords – ReDim. Writing code in Visual Basic – The anatomy of a procedure – Subroutine and Functions – Language constructs – For...Next, The While loop, Select case...End select, Exit statement, with structure.

UNIT III

Selecting and Using controls – Introduction to standard controls: command buttons – Text boxes – labels – frames – option buttons – Check boxes – Scroll Bars – Timer – working with Common Dialog Control.

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UNIT IV

The Image list control – the List view control – slider control – status bar control – Tool bar control – The Tree view control – Menu editor. –File System Controls (Drive, Dirlist, File List boxes).

UNIT V

OLE properties – OLE automation – building COM/OLE DLL servers – Data control – design time(for access – style databases) –programming with the data control– Database access – set using SQL –transaction control – testing the control – Open Database Connectivity.

EMPLOYABILITY

OUTCOMES:

Upon completion of this course, the student will be able to:

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Implement syntax rules in Visual Basic programs.
- Write Windows applications using forms, controls, and events
- Write and apply decision structures for determining different operations.
- Write and apply loop structures to perform repetitive tasks.

REFERENCE BOOKS:

1. Mohammed Azam, Programming with Visual Basic 6.0 – Vikas Publishing House Pvt Ltd – 2002(unit-I, unit-II)
2. Content Development Group, Visual Basic 6.0 – Tata McGraw Hill Publishing Company Limited – 2002(unit-III, unit-IV, unit-V)

Course Code	Course Title	L	T	P	C
20113AEC44A	Allied Physics-II	5	1	0	5

Digital Electronics

AIM:

To understand various digital system and their applications

OBJECTIVES:

To learn about the design principles of different digital electronic circuits.

To study the application digital electronics circuits

UNIT – I: NUMBER SYSTEMS AND CODES:

Decimal, Binary, Octal, and Hexa decimal systems – Conversion from one to another – Binary addition – Binary subtraction – Binary multiplication – Binary division – Complements, Codes: BCD, Gray, Alpha numeric.

UNIT – II: BOOLEAN ALGEBRA:

Basic logic gates – Universal gates – Fundamental concepts of Boolean algebra – De Morgan’s theorem: Simplification of expressions – Karnaugh map.

UNIT – III: LOGIC DESIGN:

Half adder – Half subtractor – Multiplexers – Demultiplexer, Flip-flops: R-S flip flop, J-K flip flop, D-flip flop, T-flip flop.

UNIT – IV: MEMORY ELEMENTS:

RAM – types – ROM: ROM, PROM, EPROM, EEPROM – Magnetic tape – Magnetic disc – Bubble memory.

UNIT – V: REGISTERS AND COUNTERS:

Registers: Shift register – Left shift register – Right shift register – Counters: Ripple counter – Mode N counter – up counter – down counter.

SKILL DEVELOPMENT

LEARNING OUTCOMES

Express positive integers in different number systems (binary, octal, decimal hexadecimal)

Codify data elements or information (signal values) by binary variables (signals) using standard codes for positive integers (binary, BCD, Gray) and characters (ASCII code)

Codify signed integers (positive and negative) using the two's-complement system

Perform basic arithmetic operations (addition, subtraction, multiplication) of signed integers by means of the 2's complement system

List a set of simulation tools for digital electronics

REFERENCE BOOKS:

- 1) Digital Principles and Applications by Malvino and Leach

Course Code	Course Title	L	T	P	C
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201ENSTU45	Environmental Studies	2	0	0	2
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UNIT-I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance - Need for public awareness - **Natural Resources: Renewable and Non-Renewable Resources** - Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources.

UNIT-II

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Types of ecosystem - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems.

UNIT-III

Biodiversity and its Conservation – Definition - Genetic, species and ecosystem diversity - Biogeographical classification of India - Values of biodiversity - Biodiversity at global, National and local levels - India as a mega - diversity nation - Hot-spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity.

UNIT-IV

Environmental Pollution – Definition - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - **Thermal pollution - Nuclear hazards - Solid waste Management - Role of an individual in prevention of pollution - Disaster management.**

UNIT-V

Social Issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics - Climate change green house effect and global warming - Ozone depletion - Waste land reclamation - Consumerism and waste products - Environmental Legislation - Issues involved in enforcement of environmental legislation - Public awareness - Human Population and the Environment.

EMPLOYABILITY

Course Outcomes:

CO 1: Discover knowledge in ecological perspective and value of environment.

CO 2: Understand the significance of various natural resources and its management.

CO 3: Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.

CO 4: Categorize different types of pollutions and their control measures. Discover effective methods of waste Management. Analyze global environmental problems and come out with best possible solutions.

CO 5: Understand environmental laws and sustainable development.

REFERENCE BOOK:

1. "ENVIRONMENTAL STUDIES", K.Kumarasamy, A.Alagappa Moses, M.Vasanthi.

Course Code	Course Title	L	T	P	C
20122SEC46L	Visual Programming Lab	0	0	3	2

1. Simple exercises using standard controls.
2. Write a program to design a calendar of any year.
3. Write a program to expand and shrinking an object – while program is running.
4. Write a code to design and implement a scientific calculator.
5. Write a program to create animation by using move method and timer Object.
6. Write a program for preparing students mark list.
7. Write a program to populate the label entities using data bound control.
8. Write a program to expand and shrink Objects using timer control and move method

SKILL DEVELOPMENT

Course Outcome:

- Design,create,build and debug visual basic applications.
- Apply arithmetic operations for displaying numeric output.
- Apply decision structures for determining different operations.
- Write windows applications using forms,controls and events.
- Create one and two dimensional arrays for sorting,calculating and displaying of data.
- Write Visual Basic programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism

Course Code	Course Title	L	T	P	C
20113AEC47AL	Allied Physics Lab -I	0	0	3	2

- 1) FET-Characteristics
- 2) Logic Gates-Universality of NOR Gate.
- 3) LCR — Series Resonance Circuit.
- 4) LCR parallel – resonance circuit.
- 5) OP AMP-Addition,Subtraction.
- 6) Verification basic logic gates.
- 7) Verification of Demorgon’s theorem..
- 8) Half adder and Half subtractor.
- 9) Logic Gates-Universality of NAND Gate.
- 10) OP AMP Differentiator ,Intergrator.

EMPLOYABILITY

Course Outcome:

Learn the basics of gates.

Construct basic combinational circuits and verify their functionalities.

Apply the design procedures to design basic sequential circuits.

Learn about counters.

Learn about Shift Registers.

To understand the basic digital circuits and to verify their operation.

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

- a. **Understanding Leadership and its Importance**
 - What is leadership?
 - Why Leadership required?
 - Whom do you consider as an ideal leader?
- b. ***Traits and Models of Leadership***
 - Are leaders born or made?
 - Key characteristics of an effective leader
 - Leadership styles
 - Perspectives of different leaders
- c. ***Basic Leadership Skills***
 - Motivation
 - Team work
 - Negotiation
 - Networking

UNIT II - Managerial Skills

- a. **Basic Managerial Skills**
 - Planning for effective management
 - How to organise teams?
 - Recruiting and retaining talent
 - Delegation of tasks
 - Learn to coordinate
 - Conflict management
- b. ***Self Management Skills***
 - Understanding self concept
 - Developing self-awareness
 - Self-examination
 - Self-regulation

UNIT III - Entrepreneurial Skills

- a. **Basics of Entrepreneurship**
 - Meaning of entrepreneurship
 - Classification and types of entrepreneurship
 - Traits and competencies of entrepreneur
- b. ***Creating Business Plan***
 - Problem identification and idea generation
 - Idea validation
 - Pitch making

UNIT IV - Innovative Leadership and Design Thinking

- a. **Innovative Leadership**

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. *Design Thinking*

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. *Learning through Biographies*

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. *Ethics and Conduct*

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us All*. William Collins

- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019- 02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

EMPLOYABILITY

Course outcomes:

- Identify different leadership styles;
- Select the leadership style that best suits their situation;
- Communicate effectively by saying no, delegating, and promoting others' growth;
- Improve their social skills and social understanding;
- Mediate conflicts in their work environment.

Course Code	Course Title	L	P	T	C
201ACSSBBE	Basic Behavioural Etiquette				

Aim:

Objectives:

Training is mainly focused on discipline, grooming, career planning and building personality. As it is the first year of the university, students are given awareness about the job market right from the start so that they prepare accordingly at their own pace and potential.

Eliminating negative thought, developing enriching habits, unlocking individual potentials and well versed communication is the aim of this program. The module consists of

- Communication Skills
- Goal Setting
- Career Planning
- Reaching your Potential
- Time Management
- Stress Management
- Grooming and Discipline
- Learning skills
- Listening Skills
- Team Building

EMPLOYABILITY

Course Outcome:

Etiquette helps us to be thoughtful about our conduct.

It helps us to be aware of the feelings and rights of others. By eliminating discourteous behaviour and prioritising other people's feelings, etiquette promotes kindness, consideration, and humility.

Business etiquette training, a key part of soft skills & communication, facilitated by Momentum enlightens participants on the accepted behaviour patterns and manners key to their profession.

It emphasises on a set of practices used and accepted in a multi-national work environment.

Course Code	Course Title	L	P	T	C
201ACSSAQA	General Aptitude and Quantitative Ability				

Aim:

1. General Aptitude

- Introduction
- Introduction to Aptitude Tests
- Diagnostic Tests
- Introduction to Speed Maths
- Quantitative Ability – Number Theory
- Numbers
- Properties of Numbers
- Concept of Multiples and Factors
- LCM and HCF
- Factorial Concept
- Last Digit Concept
- Remainders Concept

Quantitative Ability – Arithmetic - 1

- Percentage
- Ratio and Proportion
- Simple Interest and Compound Interest
- Profit Loss
- Discount
- Mixture and Allegation
- Questions from Company Papers will be discussed

Quantitative Ability – Arithmetic - 2

- Speed Distance Time
- Time and Work
- Chain Rule
- Clocks and Calendars
- Averages
- Questions from Company Papers will be discussed

Quantitative Ability – Algebra

- Basic Terminologies in Algebra
- Equations
- Simple Equation
- Quadratic Equation
- Cubic Equation
- Functions
- Graphs
- Maxima and Minima
- Questions from Company Papers will be discussed

Quantitative Ability – Modern Maths

- Set Theory
- Fundamental way of Counting
- Permutations and Combinations
- Probability
- Questions from Company Papers will be discussed
- Data Analysis
- Data Sufficiency

Analytical and Logical Reasoning

- Mono variate conditions
- Multi variate conditions

Puzzles

- Coding
- Decoding
- Family tree
- Direction sense
- Alpha numeric
- Brain teasers

Deductive Reasoning

Visual Sequence

Mathematical Reasoning

2. English Aptitude

- Fill in the blanks

- Comprehension
- Odd man out
- Phrases and Sentences
- Sequencing
- Basic Grammar
- Meanings

EMPLOYABILITY

Course Outcomes:

- The student will be able to • Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.
- " The main aim of introducing "Quantitative Aptitude"for mathematics students is to develop skill to meet the competitive examinations for better job opportunity.
- Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.
- Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.

This course consists of practice exercises for Quantitative or Numerical and Verbal Ability. Prepare for Aptitude Tests for Entrance Exams like GATE, CAT, Bank PO, SAT, GMAT, GRE, UPSC and RRB.

Course Code	Course Title	L	P	T	C
201ACSSIST	Interview Skills Training and Mock Test				

Aim:

➤ Exclusive Pre-Placement Training – both General Aptitude and Technical Aptitude is carried out by External Training firms, Corporate Professionals for final year students.- with a focus on the Corporate Selection Process during the Campus Hiring Visit

➤ Mock Tests on Company Specific Aptitude Question papers are carried out along with Mock Interviews. Based on such companies face-to-face-Technical & HR – interviewing style and finally placement offer provide to the students.

EMPLOYABILITY

Course outcomes:

Help candidates reduce their stress and anxiety before a real job interview.

Help you boost your confidence.

Provide you with useful feedback in a low-stress environment.

Help you prepare for behavioral-based interview questions.

Interviewing Skills Training focuses on the skills required to conduct engaging interviews that include effective questions.

This will allow a hiring manager or interviewer to ensure the best practices are followed to hire the right candidates with the applicable skills, behavior, and mindset.

Course Code	Course Title	L	T	P	C
20122SEC51	Relational Database Management Systems	4	1	0	4

AIM

To equip the students with principles and concepts of database design

OBJECTIVES:

- To learn the basic principles of database and database design
- To learn the basics of RDBMS
- To learn the concepts of database manipulation SQL

UNIT- I

An Overview of Database Management-Introduction -Definition of Database system - Data Independence - Relational Systems - Database System Architecture - Three Levels of the Architecture - Distributed Processing.

UNIT -II

An Introduction to Relational Databases- Introduction - Relational Model - Relations and Relvars - Optimization - Transactions - An Introduction to SQL - Embedded SQL - Domains , Relations , Relvars.

UNIT- III

Relational Algebra - Introduction - Syntax - Semantics - Examples - Additional Operators - Relational Calculus - Introduction - Tuple Calculus - Examples - Calculus Vs Algebra - Domain Calculus - SQL Specialties .

UNIT -IV

Database Design - Functional Dependencies - Introduction - Basic Definitions - Normalization - First , Second ,Third Normal Forms - BOYCE / CODD Normal Form

UNIT- V

Transaction Management - Recovery - Introduction - Transactions - Transaction Recovery - System Recovery - Media Recovery - Concurrency -Three Concurrency Problem - Locking - Deadlock - Serializability .

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Design Databases for applications.
- Use the Relational model, ER diagrams.
- Design the Query Processor and Transaction Processor.

REFERENCE BOOKS:

“An Introduction to Database Systems”. C.J.DATE. Addison - Wesley Publications - 7th Edition 2000.

Course Code	Course Title	L	T	P	C
20122SEC52	.NET Programming	4	1	0	3

AIM

To cover the fundamental concepts of the .NET framework.

OBJECTIVES

- To gain knowledge in the concepts of the .NET framework and its technologies.
- To get experience in building sample applications of large-scale projects.

UNIT I

Visual basic.NET and the .NET Framework –The elements of Visual Basic .NET

UNIT II

Visual Basic .NET operators-software Design, conditional structures, and controls Flow-Methods.

UNIT III

Interfacing with the End user-Asp.NET Applications.

UNIT IV

Web Form Fundamentals – Web Controls – Validation and Rich Controls.

UNIT V

ADO.NET Data Access – Data Binding –Data List, DataGrid, and Repeater.

EMPLOYABILITY

OUTCOMES:

- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio.
- Utilize the .NET environment to create Web Service-based applications and components.

REFERENCE BOOKS:

1. The Complete Reference VB.NET – Jeffrey R-Shapiro- Tata McGrawHill Edition
2. The Complete Reference ASP.NET- Matthew MacDonald- Tata McGrawHill Edition
3. Visual Basic .Net Programming -Bible.
4. Visual Basic.Net Black Book- Steven Holzner.

Course Code	Course Title	L	T	P	C
20122SEC53	Designing and supporting Computer Networks	4	1	0	4

AIM:

To equip the students with Computer Networks

OBJECTIVE:

- To learn the Network concepts
- To understand the Network Switching Concepts
- To study about Network Security.

UNIT I

The Internet and its uses – OSI model – ISP Troubleshooting – Planning a Network Upgrade

UNIT II

Planning the Addressing Structure – IP Addressing in the LAN – NAT and PAT – Configuring Network Devices: Initial ISR Configuration – Configuring an ISR with SDM

UNIT III

Configuring a Router Using IOS CLI – Connecting the CPE to the ISP – Routing: Enabling Routing Protocols – Exterior Routing Protocols

UNIT IV

ISP Services: Protocols that support ISP Services – DNS – Services and Protocols – ISP Responsibility: ISP security considerations – Security tools

UNIT V

Monitoring and Managing the ISP – Backups and Disaster Recovery – Troubleshooting: Troubleshooting Methodologies and Tools

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the components required to build different types of networks
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Trace the flow of information from one node to another node in the network

REFERENCE BOOKS:

“Working at a Small-to-Medium Business or ISP CCNA Discovery Learning Guide” – Allan Reid and Jim Lorenz – CISCO Press – Pearson Education

Course Code	Course Title	L	T	P	C
20122DSC54A	Computer Organization and Architecture	4	1	0	3

AIM:

To equip the students with the Computer Organization and Architecture.

OBJECTIVES:

- To Make Students Understand The Basic Structure And Operation Of Digital Computer.
- To Familiarize The Students With Arithmetic And Logic Unit And Implementation Of Fixed Point And Floating-Point Arithmetic Operations.
- To Expose The Students With Different Ways Of Communicating With I/O Devices And Standard I/O Interfaces.

UNIT I

Digital logic circuits: Digital computers- Logic gates – Boolean algebra - Map simplification - Combinational circuits - Flip-flops - Sequential circuits.

UNIT II

Digital components: Integrated circuits – Decoders - Multiplexers - Registers - Shift Registers - Binary Counters - Memory unit.

UNIT III

Data Representation: Data types - Complements

– Fixed point representation –Floating Point representation – Other binary codes – Error detection codes.

UNIT IV

Central processing unit: General Register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – Reduced instruction set computers.

UNIT V

Memory Organization: Memory hierarchy – Main memory – Auxiliary memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management and Hardware.

SKILL DEVELOPMENT

OUTCOMES:

At the end of the course, the student should be able to:

- Design arithmetic and logic unit.
- Design and analyse pipelined control units
- Evaluate performance of memory systems.

REFERENCE BOOKS:

1. Computer System Architecture - Morris Mano.M PHI, Third Edition - 1999
2. Digital Computer Fundamentals – Thomas C. Bartee- Sixth Edition - TataMcGrawHill.
3. Digital Design – Mano – Second Edition

Course Code	Course Title	L	T	P	C
20122DSC54B	E-Learning	4	1	0	3

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

EMPLOYABILITY

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.

4. Moodle 2.0 First Look, Mary Cooch, 2010.

Course Code	Course Title	L	T	P	C
20122SEC55L	Oracle Lab	0	0	3	2

1. Write SQL queries to create the following tables and insert rows in it.

Employee (eno, ename, deptno, salary, designation)

Dept (deptno, deptname, location)

Student (rollno, name, course, paper1, paper2, paper3)

2. Write SQL queries to create primary key and foreign key constraints in the above given tables and perform all types of **simple retrieval**.

3. Write SQL queries to perform all types of **advance retrieval** using (i) nested subqueries (ii) set operators.

4. Write SQL queries to perform all types of **joins**.

5. Write SQL queries to illustrate all **built-in** functions.

6. Write SQL queries to create **views** and **index/indices** for the tables Employee, Dept and Student.

7. Write a database trigger to prevent transactions during weekend. Create PL/SQL procedures and store them in a package and execute them in the command prompt.

8. Write a PL/SQL program that prints mark sheet of students in a University using cursor.

SKILL DEVELOPMENT

Course Outcomes:

Brief knowledge about SQL Fundamentals

Unary and Binary table Operations.

Able to handle with different database languages.

Table view, Log and Triggers.

Handling online Transactions.

Database Connectivity with front-end.

Course Code	Course Title	L	T	P	C
20122SEC56L	.NET Programming Lab	0	0	3	2

1. Write a program in VB. Net to check whether given number is Odd or Even.
2. Write a program to find maximum from given numbers.
3. Write a program to find are of a circle
4. Design ASP.Net web form using Html Server Controls to enter job seeker's details.
5. Create an ASP.Net web form using Web control to enter E-Mail registration form.
6. Apply appropriate validation techniques in E-Mail registration form using
7. Validation controls.
8. Write an ASP.Net application to retrieve form data and display it the client browser in a table format.
9. Create a web application using ADO.Net that uses which performs basic data Manipulations:

i). Insertion (ii) Updating (iii) Deletion (iv) Selection
Hint: Do operations using Ms-Access and SQL-Server

10. Create an application using Data grid control to access information's from table in SQL server.

SKILL DEVELOPMENT

Course Outcome:

Contrast and compare major elements of the .NET Framework and explain how C# fits into the .NET platform.

Analyze the basic structure of a C# application and be able to document, debug, compile, and run a simple application.

Create, name, and assign values to variables.

Use common statements to implement flow control, looping, and exception handling.

Create methods (functions and subroutines) that can return values and take parameters.

Create, initialize, and use arrays.

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Aim:

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
 - Difference between a CV, Resume and Bio data
 - Essential components of a good resume
- ii.* **Resume skills : common errors**
- Common errors people generally make in preparing their resume
 - Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

- i.* **Interview Skills : Preparation and Presentation**
- Meaning and types of interview (F2F, telephonic, video, etc.)
 - Dress Code, Background Research, Do's and Don'ts
 - Situation, Task, Approach and Response (STAR Approach) for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
 - Important questions generally asked in a job interview (open and closed ended questions)
- ii.* **Interview Skills : Simulation**
- Observation of exemplary interviews
 - Comment critically on simulated interviews
- iii.* **Interview Skills : Common Errors**
- Discuss the common errors generally candidates make in interview
 - Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.

- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

EMPLOYABILITY

SEMESTER – VI

Course Code	Course Title	L	T	P	C
20122SEC61	Advanced Web Technology	4	1	0	4

AIM:

To equip the students with basic programming skill in Web Designing

OBJECTIVES:

- To understand and practice mark up languages
- To understand and practice embedded dynamic scripting on client side Internet Programming
- To understand and practice web development techniques on client-side

UNIT-I

Introduction to HTML – Head and body sections – Designing the body section. Ordered and unordered lists – Table handling.

UNIT-II

DHTML and Style Sheet – Frames-Forms.

UNIT-III

VBScript –VBScript Programming Basics – Working with Operators – Controlling Program flow with VBScript- Working with Functions, Subroutines and Dialog boxes – Data type Conversion Features – Putting it all together with VBScript – using the Script Debugger.

UNIT-IV

The Basic of JavaScript: Overview of JavaScript – Object Orientation and JavaScript – General Syntactic Characteristics – Primitives, Operation and Expressions – Screen Output and Keyboard Input – Control Statements – Object Creation and Modification – Arrays – Functions – Constructors – Pattern Matching Using Regular Expressions. **JavaScript and Html Documents: The JavaScript Execution Environment.**

UNIT-V

Introduction to PHP: Origins and Uses of PHP – Overview of PHP – General syntactic characteristics – Primitives, Operation and Expressions – Output – Control Statements – Arrays – Functions – Pattern Matching – Form Handling – Files – Cookies – Session Tracking.

EMPLOYABILITY

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Acquire knowledge about PHP.

REFERENCE BOOKS:

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

For UNIT I & II.

2. “Using Active Server Page”. - Scot Johnson-For UNIT III.

3. “Programming the World Wide Web” - Robert W.Sebesta , Third edition.

For UNIT IV, V.

Course Code	Course Title	L	T	P	C
20122SEC62	Operating System	4	1	0	5

AIM:

To equip the students with operating system and their components

OBJECTIVES:

The student should be made to:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

UNIT- I

Evolution of Operating Systems – Types of Operating Systems – Different views of OS – Design and implementation of Operating Systems – I/O Programming concepts – Interrupt structure and Processing.

UNIT-II

Memory management: Single contiguous allocation – Partitioned Allocation – Relocatable Partitioned Allocation – Paged and Demand Pages Memory Management – Segment Memory Management – Segmented and Demand Paged Memory Management – Swapping and Overlay Techniques.

UNIT- III

Processor management: Job Scheduling – Process Scheduling – Functions and Policies – Evaluation of Round Robin Multiprogramming performance – Process synchronization – Race condition – Synchronization Mechanism – Deadly Embrace Prevention and Detect and Recover Methods.

UNIT- IV

Device management: Techniques for device management – Device Characteristics – I/O Traffic controller, I/O scheduler, I/O device handler – Virtual Devices – Spooling

UNIT-V

File management: Simple file system, General Model of a file system, Physical and Logical file system. Case studies: DOS, UNIX/LINUX Operating systems

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers.

REFERENCE BOOKS:

1. Operating systems – E. Madnick and John J. Donovan – Tata McGraw Hill
2. Operating Systems (Concepts and Design) Milan Milenkovic – McGraw Hill International Edition

Course Code	Course Title	L	T	P	C
20122DSC63A	Software Project management	4	1	0	3

UNIT I INTRODUCTION TO PROJECT MANAGEMENT

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT III ACTIVITY PLANNING

Objectives – Project Schedule – Sequencing And Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity On Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT IV MONITORING AND CONTROL

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS

Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman–Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

EMPLOYABILITY

Outcome:

Identify the different project contexts and suggest an appropriate management strategy.

Practice the role of professional ethics in successful software development.

Identify and describe the key phases of project management.

Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Plan and manage projects at each stage of the software development life cycle (SDLC)

Create project plans that address real-world management challenges

REFERENCES:

1. Bob Hughes and MikeCotterell “Software Project Management”, Third Edition, TATA McGraw Hill Edition 2004.
2. Ramesh, Gopaldaswamy: "Managing Global Projects ", Tata McGraw Hill, 2001.
3. Royce.” Software Project Theory”, Pearson Education, 1999.
4. P.Jalote “Software Project Management In Practice”, Pearson Education, 2000.

Course Code	Course Title	L	T	P	C
20122DSC63B	Object oriented analysis and design	4	1	0	3

AIM:

To equip the students with object oriented analysis and design

OBJECTIVES:

The student should be made to:

- Learn the basics of object oriented analysis and design skills.
- Learn the UML design diagrams.
- Learn to map design to code.
- Be exposed to the various testing techniques.

UNIT- I

Introduction to object-oriented Development- object-oriented themes – Modeling- The object modeling Technique- object and classes Links and Associations concepts- Generalization and Inheritance- Grouping constructs.

UNIT- II

Advanced object modeling- Aggregation- Abstract classes- Extension and Restriction- Multiple inheritance- Metadata – Candidate keys- Constraints. Dynamic modeling:- Events and states – Operations- Nested state diagram- Concurrency. Function modeling:- Functional models- Data flow diagram- Specifying operations- Constraints.

UNIT- III

OMT as software Engineering Methodology- The OMT Methodology- Impact of an object oriented Approach. Analysis: - Overview of analysis – problem statement – automated teller machine example – object modeling – Dynamic modeling – functional modeling- adding operations iterating the analysis.

UNIT- IV

System Design- overview of system design – Breaking a system into subsystem – identifying concurrency – allocating subsystems to processors and tasks – management of data stores- handling global resources – choosing software control implementation- handling boundary design – overview of object design – combining the three models – designing algorithms - design optimization - implementation of control.

UNIT- V

Implementation: Implementation using a programming language- Implementation using a database system. **Programming style:** object – oriented style – reusability – extensibility – Robustness - object oriented language features – survey of object – oriented languages.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Design and implement projects using OO concepts.
- Use the UML analysis and design diagrams.
- Apply appropriate design patterns.
- Create code from design.
- Compare and contrast various testing techniques.

REFERENCE BOOKS:

1. Object Oriented Modeling and Design – James Rumbaugh, Michael Blaha, William Premerlani – PHI Twelfth Printing – 2001.
2. Object Oriented Analysis and Design with Applications- Grady Booch Second Edition – Pearson Education Asia publications.

COURSE CODE	COURSE TITLE	L	T	P	C
201ENOE	Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition – Kinds – Elements – Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub Editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

EMPLOYABILITY

outcome:

- Classifying newspaper as a recorder of news and events, as an organ of public opinion, instrument of social service, promoter of democracy.
- Defining News and understanding its elements, news sources and different types of news.
- Understanding the role of the news editor and its functions, duties and responsibilities.
- Analyzing the duties and qualities of Chief Sub editor and Sub editors.

- Understanding news writing and different structures of news writing.
- Analyzing crime and legal reporting, science and financial reporting.

References:-

Journalism -Susan

Professional Journalism - John Hogenberg

News Writing and Reporting - M.James Neal (Surjeet Publication)

Professional Journalism -M.V Komath

The Journalist's Handbook -M.V Komath

Mass Communication & Journalism - D.S Mehta

COURSE CODE	COURSE TITLE	L	T	P	C
201MAOEC	Development Of Mathematical Skills	4	0	0	2

Objectives

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.

To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

1. P.A.Navanitham, Business Mathematics & Statistics
2. Kanti swarup, P.K.Gupta and Manmohan, “ Operations Research”

SKILL DEVELOPMENT

Learning outcomes

- By the end of this course, you should be able to
- know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, statistics, Matrices and Business mathematics)

- use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Course Code	COURSE TITLE	L	T	P	C
201PHOEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.

A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data. Understand that there are finite limits to our ability to make good measurements, and why.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges :

AC bridges – Maxwell, Owen, Schering and deSauty’s bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using

rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters –

Component measuring instruments (quantitative studies)

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation

amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

EMPLOYABILITY

Learning Outcomes:

Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.

Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K.

Sawhmey – DhanpatRai and Sons – 1990.

2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill –1975.

Course Code	COURSE TITLE	L	T	P	C
201CHOEC	Food and Adulteration	4	0	0	2

Aim: To introduce students to food safety and standardization act and quality control of foods.

Objectives:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislative aspects of adulteration.
3. To educate about standards and composition of foods and role of consumer.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

SKILL DEVELOPMENT

Course outcomes:

Understand various areas of Food Safety & Quality Assurance.

Grasp knowledge of the quality assessments of food products.

Comprehend food quality management systems.

Apprehend the Indian and International food laws.

Conceive the concept of adulteration in food products.

Apprehend the quality assessment of food products using various instruments.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	COURSE TITLE	L	T	P	C
201MBOEC	Wild Life Conservation	4	0	0	2

Aim:

To enable the students understand the need of conservation of wildlife in India.

Objectives:

Maintenance of rare species in protected areas such as national parks, santuries etc.,
Establishment of specific biosphere reserves for endangered plants and animals.
Protection of wild life through legislation such as banning hunting etc.,
Imposing specific restrictions on export of endangered plants and animals or their products.

Outcome:

Protection of natural habitats of organisms through controlled exploitation.

Educating the public about the need to protect and preserve the environment as a long range goal for the welfare of future generations

Unit I: Wildlife Management: Basic concepts and principles - Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA –

Evaluation of Wildlife habitat: Define habitat – Forest habitat types - basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect – Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species.

Unit II: Introduction to conservation biology, the origin of conservation biology, ethical and economical values of conservation biology, definition of biodiversity, types of biodiversity, threats to biodiversity. Scopes and importance of conservation methods – *In-situ* and *Ex-situ* conservation approaches of Indian animals. Captive breeding (Lion-tailed macaque, white tiger and vultures) and reintroduction (Tiger, rhinoceros, gaur).

Unit III: Biodiversity: Definition and importance - Biodiversity hotspots in India: Western Ghats, Eastern Himalayas. Mega diversity nations – an introduction. Landscape approach and people participation in biodiversity conservation.

Unit IV: Role of Government and Non-Government organizations in conservation.–
Government - Wildlife Institute of India, Ministry of Environment and Forests (MoEF), National Biodiversity Authority (NBA), Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Salim Ali Centre for Ornithology and Natural History (SACON), Centre for Ecological Sciences (CES). **NGOs.** –Bombay Natural History Society (BNHS), World Wide Fund for Nature (WWF), Wildlife Trust of India (WTI), Nilgiri Wildlife and Environment Association (NWEA), Wildlife Conservation Society (WCS).

Unit V:

Conservation Biology Tools - Biological Parks, Zoological Parks, Forest Research Institute, Agricultural Research Institutions, Gene Pools, Cryopreservation Centres, Interpretation Centres and role of Field Biologists.

SKILL DEVELOPMENT

Outcome:

Wildlife habitat studies will enable students to solve problems of conservation.

Describe habitat management.

Understanding of Conservation will help protection of wildlife.

Explain wildlife trade that may enhance the economy.

Wildlife legislation will systematically organize the understanding of wildlife conservation, trade and management.

Evaluate current events and public information related to wildlife conservation as being scientifically-based or opinion-based and contribute to the knowledge base of information.

References:

1. Anon, 1992. Conservation on biological diversity. Text and annexure. WWF-India.
2. Gaughley, G. and A. Gunn. 1993. Conservation Biology in Theory and practice. Blackwell Publishers.
3. Dobson, A.P. 1996. Conservation and biodiversity scientific American Library, New York, USA.

Course Code	Course Title	L	T	P	C
201CSOEC	E-Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 **E-Learning Course Development – Features, Architecture, Installation and Configuring Site.**

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

EMPLOYABILITY

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.

2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

B.COM

COURSE CODE	COURSE TITLE	L	T	P	C
201CMOEC	BANKING SERVICES	5	0	0	5

AIM:

To Provide the Bank is financial institution which is involved in borrowing and lending money.

OBJECTIVE: you should be able to

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits-Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking-Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features- Registration-Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM- Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

EMPLOYABILITY

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking, ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness – N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh,Justinpaul

Course Code	Course Title	L	T	P	C
20122SEC64L	Advanced Web Technology Lab	0	0	3	2

1. Create a small paragraph about 10 lines. Try to use different font, title, head tags, Size and colors.
2. Create a table with rows & columns and split them using row span & cols pan.
3. Create a web page in the format of front page of a newspaper using text link
4. Write a program for addition using VBScript.
5. Develop a picture gallery having at least 3 pages. Each of them is having several pictures.
6. Create a java script for automatic type conversion.
7. Develop a Java Script program that handles event using button and check box.
8. Develop a program using java script for events handling text area and text field.
9. Develop a calculator for simple calculation using java script.
10. Develop a PHP program and check message passing mechanism between pages.

EMPLOYABILITY

Course Outcome:

- Understand analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP, PHP and protocols in the workings of the web and web applications.
- Analyze a web page and identify its elements and attributes.
- Create a web pages using HTML,DHTML and Cascading styles Sheets.
- Create interactive web applications using ASP.NET.
- Build and consume web services.
- Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

Course Code	Course Title	L	T	P	C
20122SEC65L	Operating System Lab	0	0	3	2

1. Write a menu driven shell program for the following:
 - a. List of files.
 - b. Processes of users.
 - c. Today's Date
 - d. Users of system.
 - e. Quit of Unix

2. Write a shell program which accepts the name of a file from the standard input and tests to find the file access permissions, such as read, write and execute.

3. Write a shell program which accepts the name of a file from the standard input and perform the following

- a. Accept five names in a file.
- b. Sorts the names in existing file.
- c. Lists unsorted and sorted file.
- d. Quit

4. Write a menu driven shell program to copy, edit, rename and delete a file.

5. Write a menu driven shell program to perform the following task
 - a. Write a sentence in file.
 - b. Search for a given word or pattern in an existing file.
 - c. Quit.

6. Write a shell program to prepare electricity bill for domestic consumers.

For first 100 units – Rs. 0.75 / Unit

For next 100 units – Rs. 1.50 / Unit

Above 200 units – Rs. 3.00 / Unit

Prepare the bill for the following format.

7. Write a shell program to display the result PASS or FAIL using the information given below student name, student register number, mark1, mark2, mark3, mark4 the minimum pass for each subject is 50.

8. Merge the contents of the file file1, file2 and store in another file

SKILL DEVELOPMENT

COURSE OUTCOME

- INSTALL A LINUX OPERATING SYSTEM WITH A CUSTOM PARTITIONING SCHEME AND LOG INTO AND OUT OF A UNIX/LINUX COMPUTER SYSTEM USING GRAPHICAL AND COMMAND LINE ENVIRONMENTS.
- USE UNIX/LINUX COMMAND LINE (SHELL) COMMANDS TO NAVIGATE AND MANAGE THE UNIX/LINUX FILE SYSTEM, CUSTOMIZE THE USER SHELL ENVIRONMENT,
- USE ARCHIVING AND COMPRESSION TO BACK UP FILES.
- USE FILE NAME GLOBING AND REGULAR EXPRESSIONS TO FIND FILES AND TEXT IN THE SYSTEM.
- TO MANAGE USER AND GROUP ACCOUNTS AND PERMISSIONS.
- TO MANAGE PROCESSES AND JOBS.

Course Code	Course Title	L	T	P	C
20122PRW66	Project Work	0	0	0	4

Each student will develop and implement individually developed application software based on any of the latest technologies.

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Aim:

Course Objectives:

To develop an appreciation of rural culture, life-style and wisdom amongst students

To learn about the status of various agricultural and rural development programmes

To understand causes for rural distress and poverty and explore solutions for the same

To apply classroom knowledge of courses to field realities and thereby improve quality of learning

Course Outcomes:

After completing this course, student will be able to

Gain an understanding of rural life, culture and social realities

Develop a sense of empathy and bonds of mutuality with local community

Appreciate significant contributions of local communities to Indian society and economy

Learn to value the local knowledge and wisdom of the community

Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages” (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

SKILL DEVELOPMENT

Course outcomes:

Demonstrate an ability to engage respectfully with others in a diverse society.

Convey a message effectively.

Demonstrate an ability to engage respectfully with others in a diverse society.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B.C.A., curriculum, the following Research Skill Based Courses are introduced in the B.C.A., curriculum.

Semester	RSB Courses	Credits
II	Research Led Seminar	1
III	Research Methodology	2
V	Participation in Bounded Research	1
VI	Project Work	4

Blueprint for assessment of student's performance in Research Led Seminar Course

•	Internal Assessment:	40 Marks
•	Seminar Report (UG)/Concept Note(PG)	: 5 X 4= 20 Marks
•	Seminar Review Presentation	: 10 Marks
•	Literature Survey	: 10 Marks
•	Semester Examination	60
	Marks	
	(Essay type Questions set by the concerned resource persons)	

Blueprint for assessment of student's performance in Research Methodology Courses

	Continuous Internal Assessment:	20 Marks
•	Research Tools(Lab) :	10 Marks
•	Tutorial:	10 Marks
	Model Paper Writing:	40 Marks
•	Abstract:	5 Marks
•	Introduction:	10 Marks
•	Discussion:	10 Marks
•	Review of Literature:	5 Marks
•	Presentation:	10 Marks
	Semester Examination:	40 Marks
	Total:	100 Marks

Course Code	Course Title	L	T	P	C
20122DSC56B20	Data Mining	5	0	0	4

OBJECTIVE

- To understand briefly some of the data mining Techniques.
- Discuss a number of more efficient algorithms.
- To know accuracy of classification methods and how accuracy may be improved.

UNIT-I

Introduction: What is Data Mining- Why Data Mining now-**The Data Mining Process-Data Mining Application**-Data Mining Techniques-The Future of Data Mining-Guidelines for Successful Data Mining-Data Mining Software-Software Evaluation and Selection.

UNIT-II

Association Rules Mining: Introduction-Basics-The Task and a Naïve Algorithm - The Apriori Algorithm- Improving the Efficiency of the Apriori Algorithm- Apriori-Tid -Direct Hashing and Pruning (DHP)-Dynamic Itemset Counting (DIC)-Mining Frequent Pattern without Candidate Generation (FP-Growth)-Performance Evaluation of Algorithms- Software for Association Rule Mining

UNIT-III

Classification: Introduction-Decision Tree-Building a Decision Tree-The Tree Induction Algorithm-Split Algorithm Based on Information Theory-Split Algorithm based on the Gini Index-Over fitting and Pruning-Decision Tree Rules-Naïve Bayes Method-Estimating Predictive Accuracy of Classification Methods-Improving Accuracy of Classification Methods.

UNIT-IV

Cluster Analysis: What is Cluster Analysis-Desired Features of Cluster Analysis-Types of Data-Computing Distance-Types of Cluster Analysis Methods-Partitional Methods-Hierarchical Methods-Density-Based Methods-Dealing with Large Databases-Quality and Validity of Cluster Analysis Methods-Cluster Analysis Software.

UNIT-V

Web Data Mining: Introduction-Web Terminology and Characteristics-Locality and Hierarchy in the Web-Web Content Mining-Web Usage Mining-Web Structure Mining-WebMining Software.

ENTRENEURSHIP

OUTCOMES:

- Understanding of data mining software available on the market.
- Acquiring Knowledge about various algorithms.
- Acquiring Knowledge about cluster analysis techniques.

REFERENCE BOOKS:

1. “Introduction to Data Mining with Case Studies”, G.K.Gupta, Easter Economy Edition.

Discipline specific Elective-II

IM:

Course code	Course Title	L	T	P	C
20122DSC63A	Software Project Management				

To equip the students with the processes of software development skills

OBJECTIVE

To learn about the principles and methods of software engineering

- To understand the concepts of Software cost estimation
- To learn Software design and Implementation
- To study about development of software products from an industry perspective

UNIT I
Introduction – definition-size factors- quality and productivity factors-managerial issues.Planning - software project – introduction – defining the problem - developing a strategy - planning the development process-planning an organizational structure.

UNIT II

Software cost estimation – cost factors – cost estimation techniques – staffing – levelestimation – estimating software maintenance costs. Software requirements definition – software requirements specification techniques – languages and processors for requirements.

UNIT III

Software design – fundamental design concepts – modules and modulation criteria – design notations – design techniques – detail design considerations – real time and distributed system design – test plans – milestones walkthroughs and inspections – design guidelines.

UNIT IV

Implementation issues – structured coding techniques – coding style – standards and guidelines – documentation guidelines – data abstraction – exception handling – concurrency mechanisms.

UNIT V

Verification and validation techniques – quality assurance – walkthrough and inspections – static analysis – symbolic executions – unit testing and debugging – system testing – formal verification. Software maintenances – enhancing maintainability during development – managerial aspects – configuration management – source code metrics.

EMPLOYABILITY

Course Outcomes:

Identify the different project contexts and suggest an appropriate management strategy.

Practice the role of professional ethics in successful software development.

Identify and describe the key phases of project management.

Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

- Get an insight into the processes of software development
- Able to Model software projects into high level design using DFD,UML diagrams
- Able to Measure the product and process performance using various metrics
- Able to Evaluate the system with various testing techniques and strategies

REFERENCE BOOKS:

“Software Engineering Concepts “– Richard fairly TMH “Software Engineering”- Roger S.Pressman, 5th edition 2001.



M.C.A.,
2020 R - COURSE STRUCTURE

(For the candidates admitted in the academic year 2020-2021 onwards)

Semester I

Course Code	Course Title	L	T	P	C
20222SEC11	J2EE Programming	4	0	0	4
20222SEC12	Relational Data Base Management System.	4	0	0	4
20222SEC13	Routing and Switching in LAN	4	0	0	4
20212SEC14	Discrete Mathematics	4	0	0	4
20222DSC17_	Discipline Specific Elective – I	4	0	0	4

Semester II

Course Code	Course Title	L	T	P	C
20222SEC21	Python Programming	4	0	0	4
20222SEC22	Cryptography Network security	4	1	0	3
20222SEC23	Open Source programming	4	0	0	3
20222SEC24	Web Service	4	0	0	3
20222SEC25L	Python Programming Lab	0	0	3	2
20222SEC26L	Open Source programming Lab	0	0	3	2
20222DSC27_	Discipline Specific Elective – II	5	0	0	4
20222RMC28	Research Methodology	3	0	0	2
20222BRC29	Participation in Bounded Research	0	0	0	2
	Total	24	1	6	25

Semester III

Course Code	Course Title	L	T	P	C
20222SEC31	Data mining and warehousing	6	1	0	5
20222SEC32	Grid and Cloud Computing.	6	1	0	4
20222SEC33	.NET Programming	5	0	0	4
20222SEC34	Object Oriented System Design	5	0	0	4
20222SEC35L	.NET Programming Lab.	0	0	3	2
20222DSC36_	Discipline Specific Elective – III	5	0	0	4
20222SRC37	Societal project (Mini Project)	0	0	0	2
	Total	25	2	3	25

Semester IV

Course Code	Course Title	L	T	P	C
20222SEC41	Human Computer Interaction.	6	0	0	4
20222SEC42	Software Project Management	6	0	0	4
20222SEC43	Big Data	6	0	0	5
20222PRW44	Project work	0	0	15	10
20222PEE	Program Exit Examination	-	-	-	2
	Total	5	0	26	25
	Total Credits of the Programme				100

DISCIPLINE SPECIFIC ELECTIVE COURSES:

Semester	Discipline Specific Elective Courses
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I	a) 20222DSC17A - Mobile Computing b)20222DSC17B - Knowledge based decision support system
II	a) 20222DSC27A - Game Programming b) 20222DSC27B - Multimedia and Graphics c) 20222DSC27C - Middleware Technology
III	a) 20222 DSC 36A - Information Security b) 20222 DSC36B - Internet of Things c) 20222DSC36C - M-Marketing

Credit Distribution:

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	4	16	4		1		25
II		17	4		4		25
III		19	4		2		25
IV		13			10	2	25
TOTAL	4	65	12		17	2	100

SEMESTER I

20222SEC11	J2EE Programming	4	0	0	4
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AIM:

To enable the students to develop standalone programming and Internet based application

OBJECTIVES:

- To learn java programming concepts under Client Sever environment
- To develop Database Application in Java .
- To learn java programming concepts like reflection, native code interface, threads etc
- To develop network programs in java.
- To understand concepts needed for distributed and multi-tier applications.
- To understand issues in enterprise application development.

UNIT I

Fundamentals of OOPS-overview of java language-data type –variables and arrays-Class Fundamentals-declaring objects-constructor-overloading methods-inner classes-method overriding.

UNIT II

AWT classes-window fundamentals-AWT controls- handling events by extending AWT components Applet class-Applet architecture-html applet tag-passing parameters in applet.

UNIT III

Java Database Connectivity: JDBC/ODBC Bridge-The connectivity model being used-The java.sql Package-The JDBC Exception Classes. JDBC working with user interface: **Data manipulation-Data Navigation-Data Storage.**

UNIT IV

RMI: What is Distributed Object System? -Distributed object Technologies-RMI for distributed computing-RMI Architecture- RMI Registry service-Creating RMI Applications-Steps involved in running the RMI Applications-Removing objects from a Registry.

UNIT V

Java Servlets – Java Server Pages – Java and XML: Generating an XML Document.

EMPLOYABILITY

OUTCOMES

- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

REFERENCES

1. “Java 2 Complete Reference”, Fourth Edition, 2001,Herbert Schildt
2. Web Enabled Commercial Application Development Using Java 2.0-Ivan Bayross.
3. The Complete Reference J2ee - Keogh

20222SEC12	Relational Data Base Management System.	4	0	0	4
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AIM :

To provide an in-depth knowledge of Relational database system using Oracle.

COURSE OBJECTIVES

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

UNIT-I

Introduction- File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Introduction Relational Model and E-R model.

UNIT-II

Introduction to SQL – Basic structure and Basic operations of SQL – Set operations - Aggregate functions – Nested queries – Join expressions and views – Functions and procedure – Triggers

UNIT-III

Relational query languages - Relational algebra – Tuple relational calculus – Domain relational calculus – Relational database design - Functional dependency – Normalization – 1NF,2NF,3NF and BCNF

UNIT-IV

Transaction management - Transaction Processing –Properties of Transactions - Serializability – concurrency control lock based protocols – Deadlock handling Time Stamp based protocol - Validation Techniques - Recovery system - Log Based Recovery.

UNIT-V

Data base System Architecture – Centralized client-server Architecture- Server system Architecture – Parallel Data bases – Distributed data bases – Distributed Data storage – Distributed transaction – commit protocol – Concurrency control in Distributed Database.

EMPLOYABILITY

COURSE OUTCOMES:

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations.
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.

Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Sixth Edition, McGraw Hill, 2010.
2. C.J. Date, “An Introduction to Database Systems”, Eight Edition, Pearson Education Delhi, 2003.

20222SEC13	Routing and Switching in LAN	4	0	0	4
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AIM:

To provide complementary perspective on the LAN routing and Switching in an Enterprise.

OBJECTIVES:

- Gives a systematic approach to hierarchical network that support voice, video, and data.
- Expertise the functions of basic switch.
- Provides idea on VLAN, VTP, STP and Inter-VLAN Routing.
- Teaches components of a wireless LAN and its operations.

UNIT I

LAN Design: Switched LAN Architecture-Matching Switches to specific LAN functions.

UNIT II

Basic switching concepts and configuration-Introduction to Ethernet-802.3 LANS- Forwarding frame using switches-switch management configuration.

UNIT III

VLAN- Introducing VLAN-VLAN Trucking- Configure VLAN and Trunks.

UNIT IV

VTP-VTP –Concepts-VTP Operation- configure VTP

UNIT V

Introduction to STP-STP convergence- Inter VLAN routing-the wireless LAN.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Systematic approach to hierarchical network that support voice, video, and data.
- Idea on VLAN, VTP, STP and Inter-VLAN Routing.
- Components of a wireless LAN and its operations.

REFERENCES:

1. "LAN Switching and wireless" CCNA E xploration companion guide- wayue lewis- cisco press-pearson Education.

20212SEC14	Discrete Mathematics	4	0	0	4
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AIM:

To provide in-depth knowledge of Mathematical logics, Boolean Algebra.

OBJECTIVES:

- To understand the concept of Set Theory and Functions.
- To solve the Recurrence Relations using Generating functions.

UNIT I

Sets, Relations & Functions : Property of binary relations, Equivalence, Compatibility, Partial ordering relations, Hasse diagram, Functions, Inverse function, Compositions of functions, Recursive functions.

UNIT II

Mathematical logic : Logic operators, Truth tables, Theory of inference and deduction, Mathematical Calculus, Predicate Calculus, Predicates and Qualifiers.

UNIT III

Groups & Subgroups : Group axioms, Permutation groups, Cosets, Normal subgroups, Semi groups, Free semi groups, Monoids, Sequential Machines, Error Correcting Codes, Modular arithmetic Grammars.

UNIT IV

Lattices & Boolean Algebra: Axiomatic definition of Boolean algebra as algebra as algebraic structures with two operations, Basic results truth values and truth tables, The algebra of propositional functions, Boolean algebra of truth tables.

UNIT V

Combinatorics & Recurrence Relations : Disjunctive and sequential counting, Combinations and permutations, Enumeration without repetition, Recurrence Relation, Fibonacci relation, Solving

recurrence relation by Substitution, Solving non recurrence relation by conversion to linear recurrence relation.

EMPLOYABILITY

Course Outcome:

- Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Students completing this course will be able to use tree and graph algorithms to solve problems.
- Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
- Use the basic ideas of discrete probability
- Complete and use truth tables for expressions involving the following logical connectives: negation, conjunction, disjunction, conditional, and biconditional.

REFERENCES:

1. Trenbly J.P & Manohar. P. “Discrete Mathematical Structures with Applications to Computer Science”.
2. Kolman, Busy & Rose “ Discrete Mathematical Structures “PHI
3. K.D Joshi “ Foundations of Discrete Mathematics” , Wiley Eastern Limited.
1. Seymour Lipschutz & March Lipson Tata Mc Graw Hill.
2. C.L.Liu “ Elements of Discrete Mathematics “ Tata Mc Graw Hill.

20222SEC15L	J2EE Programming Lab	0	0	3	2
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1. Develop a simple real-life application program to illustrate the use of multithreads.
2. Packages and interfaces:

Create a package called “pgmdetails” with the following details.

Pgmdetails	(character)
Broadcastday	(character)
Stationname	(character)
Directorname	(character)
Pgmtree	(character)
Broadcasttime	(character) in railway time

Create another package called “chargedetails” with the following details

- if pgmtree is “commercials” – Rs 20 per min
- if pgmtree is “drama” – Rs 100 per min
- if pgmtree is “education” – Rs 50 per min

Inherit the necessary details from “pgmdetailes”

Using an interface “radio” calculate the amount to be paid by the programmers to the station, if they want their programs to broadcast display full information list about the given details by creating objects.

3. Create a try block that is likely to generate three types of exception and than incorporate necessary catch blocks to catch and handle them appropriately.
4. Load an image on to applet. As the user selects portions of this image, rectangular regions corresponding to the selection should be highlighted by enveloping them in rectangles (use mouse events). Also the user can change the colors of selected regions.

5. Create an application, which consists of a dialog box that could be used to obtain an user name and a password to connect to some on line service. The dialog box consists of two fields user name, password and two buttons of Ok & Cancel for accepting user input.

6. Write a program, which will open an existing file and then append text to that file.

7. Write a java program, which will make balls of various colors to move within the frame windows.

8. Create an Animating Program using Beans.

EMPLOYABILITY

Course Outcomes:

- In depth manual testing teaching with case studies.
- programmer training by creating standardized, reusable modular components and by enabling the tier to handle many aspects of programming automatically.
- Identify advance concepts of java programming with database connectivity.
- Design and develop platform independent applications using a variety of component based frameworks
- Able to implement the concepts of Hibernate, XML& EJB for building enterprise applications.

20222SEC16L	RDBMS Lab	0	0	3	2
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1. Creating, Updating and Inserting into databases and simple queries.
2. Uses of Select statement – for queries using
 - (i) AND,OR,NOT Operations, WHERE clause
 - (ii) UNION, INTERSECTION , MINUS
 - (iii) Sorting and Grouping
3. Nested queries using SQL
 - (i) Sub queries
 - (ii) Join
4. Built-in functions of SQL
5. Creation of simple forms
6. Use of indexes, creating views and querying in views
7. **Cursors, triggers and stored procedures and functions**
8. Case Studies

- i. Student Evaluation systems
- ii. Pay-roll system
- iii. Income tax calculation
- iv. Seat reservation problems
- v. Mark sheet preparation

EMPLOYABILITY

Course Outcomes:

- Sharing of data and data integrity.
- Reducing Data Redundancy.
- The file based data management systems contained multiple files that were stored in many different locations in a system or even across multiple systems.
- Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- Foundation knowledge in database concepts

20222DSC17A	Discipline Specific Elective – I Mobile Computing	4	0	0	4
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UNIT-I

Mobile Computing: An Overview of Mobile Computing-Mobile Computing Architecture-Mobile Devices-Mobile System Networks-Mobility Management. Mobile Device and Systems: Mobile

Phones-Digital Music Players-Hand Held Devices: operating System-Limitation of Mobile Devices

UNIT-II

Medium Access Control-SDMA, FDMA, TDMA-Tele Communication System:

GSM-Mobile Services-System Architecture-Satellite System: Application, Basics.

UNIT-III

Wireless LAN: Infra-red Vs Radio transmission-Infra Structure and ad-hoc networks- IEEE 802.11: System Architecture, Protocol Architecture, Physical Layer-MAC Management- HIPERLAN: WATM-Bluetooth: User Scenarios, Architecture.

UNIT-IV

Mobile IP: Goals, assumptions and requirements-Entities and terminology-IP Packet Delivery-Tunneling and Encapsulation-Reverse Tunneling-Mobile ad-hoc Networks: Overview ad-hoc routing protocols

UNIT-V

Mobile Application Language: XML, Java, J2ME & Java Card-Mobile Operating System

EMPLOYABILITY

Outcomes:

- Enhanced Productivity
- Location Flexibility.
- Streamlining of Business Processes.
- Understand fundamentals of wireless communications.
- Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.

REFERENCE BOOKS:

1. "Mobile computing"-Raj Kamal, Oxford University published in 2007. For Unit1-1,Unit-5.
- 2."Mobile Communications"-Jochen H.Schiller,published by Pearson Education Limited.For Unit-2, 3, 4.

20222DSC17B	Discipline Specific Elective – I Knowledge based decision support system.	4	0	0	4
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AIM:

To Explore the use of Artificial Intelligence techniques for applications development.

OBJECTIVES:

To understand the various AI Techniques for application development using:

- LISP programming
- Symbolic logic
- Matching techniques
- Knowledge Acquisition

UNIT I

Overview of AI – Knowledge: General Concepts – LISP and other programming languages.

UNIT II

Formalized symbolic logics – Dealing with inconsistencies and uncertainties – structured knowledge: Graphs, Frames & Related Structures – Object Oriented representations.

UNIT III

Search and control strategies – Matching Techniques.

UNIT IV

General concepts in knowledge Acquisition – Learning by induction.

UNIT V

Natural language processing – Pattern recognition – Visual image understanding – Expert system architecture.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalise a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports

REFERENCES:

1. “Introduction to Artificial Intelligence and Expert system” by Dan w.Patterson.
2. Elaine Rich and Kevin Kaight, “Artificial Intelligence”, Tata McGraw Hill, 2nd Edition, 1991.

SEMESTER II

20222SEC21	Python Programming	4	0	0	4
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AIM

To enable the student to be familiar with Python Programming.

OBJECTIVES:

On successful completion of the course the student should have understood the concepts in Python and its application.

Unit - I

Core Python: Introduction-features-Comparative study-Comments-Operators-Variables and Assignments-Numbers-String-List and Tuple-Dictionary-Statements and Iterative statements-list comprehensive-Errors and Exception-functions-Classes-Modules-Useful function. Basics: Syntax and Statements-Variable Assignments-Identifier-Style-Memory Management-Application Example. Objects: Introduction-Standard Type- Built-in-type-Internal type-Standard type operator and Built-in functions-Categorizing standard type-Unsupported type.

Unit – II

Numbers: Introduction- Integer-Floating Point-Complex numbers-Operators-Built-in-functions- Other numeric type-Sequence-Strings-Strings and Operator-String only operator-Built-in-Functions-Built-in-Methods-String Features-Unicode-Related Modules.

Unit – III

List-Operators-Built-in-Functions-Built-in-Methods-Features of List-Tuple: Introduction- Operators and Built-in-Functions-Features-Related Modules-Mapping type: Dictionaries- Operators-Built-in and Factory Functions-Built-in- Methods. Set type: Introduction-Operators- Built-in Function-Built-in Methods-Related Modules-Conditional and looping statement.

Unit – IV

File: Objects- Built in Functions-Methods-Attributes-Standard files-Command line Argument- File System-File Execution-Persistent Storage Modules-Related Module. Class: Introduction- Class and Instance- Method calls. Exception and Tools: Why use it?-Exception roles-Short story-Try/finally statement.

Unit – V

Regular Expression: Introduction-Special Symbols and characters-Regexes and Python-Examples of Regexes. Network Programming: Architecture-Socket. Internet Client Programming- Transferring files-Email.GUI Programming: Introduction-Tkinter and Python.DB Programming: Introduction-Python DB-API-Non-Relational DB. Web Services: Introduction-Microblogging with Twitter.

EMPLOYABILITY

Outcomes:

Presence of Third Party Modules.

Extensive Support Libraries.

Open Source and Community Development

Express proficiency in the handling of strings and functions.

Identify the commonly used operations involving file systems and regular expressions.

REFERENCES:

1. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
2. Wesley J Chun Core python Application Programming,3rd Edition,
3. Lutz, Mark, Learning Python, 5th Edition, O Rielly

20222SEC22	Cryptography Network security	4	1	0	3
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AIM:

To introduce about Internet Security in terms of measures to deter, prevent, detect, and correct security violations that involve the transmission of information

OBJECTIVES:

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory

- To understand authentication and Hash function.
- To know the network security tools and system level security used.

UNIT I

CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Model-substitution techniques-transposition technique-Rotor machine-Steganography.BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD: Simplified DES-Block cipher principles-The data encryption standard-the strength of DES-Differential and linear cryptanalysis-Block cipher design principles-Block cipher modes of operation.

UNIT II

PUBLIC KEY CRYPTOGRAPHY AND RSA: Principles of public key cryptosystem-The RSA algorithm.KEY MANAGEMENT OTHER PUBLIC KEY CRYPTOSYSTEMS: key management-Diffie-Hellman Key Exchange-Elliptic curve Arithmetic-Elliptic curve cryptography.

UNIT III

HASH ALGORITHM :MD5 Message Digest Algorithm-Secure Hash Algorithm-RIPEMD-160-HMAC.DIGITAL SIGNATURE AND AUTHENTICATION PROTOCOLS: Digital Signatures-Authentication Protocols-Digital Signature Standard.

UNIT IV

AUTHENTICATION APPLICATION : Kerberos-X.509 Authentication Service-Recommended Reading and Websites.ELECTRONIC MAIL SECURITY: Pretty Good Privacy-S/MIME IP Security : IP Security Overview-IP security Architecture-Authentication Header-Encapsulating Security Payload- Combining Security Associations -Key Management.WEB SECURITY : Web security considerations – Secure Socket Layer and Transport Layer Security – Secure Electronic Transactions.

UNIT V

INTRUDERS : Intruders – Intrusion detection – Password management. MALICIOUS SOFTWARES : Viruses and Related Threats – Virus countermeasures.

FIREWALLS: Firewalls Design Principles-Trusted Systems.

EMPLOYABILITY

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

REFERENCES:

1. “Cryptography and Network Security “ – William Stallings – 3rd Edition Pearson Education 2003.
2. “Network Security essentials Applications and Standards”, William Stalings , Pearson Education 2007.

20222SEC23	Open Source programming	4	0	0	3
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AIM:

To improve the Programming Knowledge of VBScript, JavaScript, Perl & PHP.

OBJECTIVES:

- To have the knowledge of VBScript, JavaScript.
- To explore the use of Perl & PHP.

UNIT I:

VBScript –VBScript Programming Basics – Working with Operators – Controlling Program flow with VBScript- Working with Functions, Subroutines and Dialog boxes – Datatype Conversion Features – Putting it all together with VBScript – using the Script Debugger.

UNIT II:

The Basic of JavaScript: Overview of JavaScript – Object Orientation and JavaScript – General Syntactic Characteristics – Primitives, Operation and Expressions – Screen Output and Keyboard Input – Control Statements – Object Creation and Modification – Arrays – Functions – Constructors – Pattern Matching Using Regular Expressions. JavaScript and Html Documents: The JavaScript Execution Environment – The Document Object Model – Element Access in JavaScript – Events and Event Handling – Handling Events from Body Elements, Button Elements, Text Box and Password Elements – The DOM 2 Event Model – The navigator Object.

UNIT III:

The Basics of Perl: Origins and Uses of Perl – Scalars and their Operations – Assignment Statements and Simple Input and Output – Control Statements – Fundamentals of Arrays – Hashes – References – Functions – Pattern Matching – File Input and Output. Using Perl for CGI Programming: The Common Gateway Interface – CGI Linkage – Query String Format – The CGI .pm Module – Cookies.

UNIT IV:

Introduction to PHP: Origins and Uses of PHP – Overview of PHP – General syntactic characteristics – Primitives, Operation and Expressions – Output – Control Statements – Arrays – Functions – Pattern Matching – Form Handling – Files – Cookies – Session Tracking.

UNIT V:

Database Access through the Web: Relational Databases – An Introduction to the Structured Query Language – Architecture for Database Access – The MySQL Database System – Database Access with Perl and MySQL – Database Access with PHP and MySQL – Database Access with JDBC and MySQL .

EMPLOYABILITY

OUTCOMES:

- Understand process of executing a PHP-based script on a webserver.
- Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
- Understand basic PHP syntax for variable use, and standard language constructs, such as conditionals and loops.
- Understand the paradigm for dealing with form-based data, both from the syntax of HTML forms, and how they are accessed inside a PHP-based script.

REFERENCES:

1. UNIT I: Scot Johnson “Using Active Server Page”.
2. UNIT II, III, IV, V: Robert W.Sebesta, “Programming the World Wide Web” Third edition.
3. Internet & WWW How to program by Deital , Third edition.

0222SEC24	Web Service	4	0	0	3
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AIM:

To have thorough knowledge about web service and web security.

OBJECTIVES:

- To provide an idea on Processing XML.
- To understand the concepts of SOAP, UDDI.
- To understand the concepts of Web security.

UNIT I

Introduction – What are web services? -Why Web Services are important?– Web services and enterprises. XML Fundamentals: XML: The Lingua Franca of web services- XML Documents- XML namespaces - XML Schema - Processing XML

UNIT II

SOAP and WSDL: The SOAP Model- SOAP- SOAP Messages - SOAP encoding – SOAP RPC- Using alternative SOAP Encodings, Document, RPC, Literal, Encoded -SOAP web services and the REST Architecture- Looking back to SOAP 1.1 - WSDL– Using SOAP and WSDL UDDI: UDDI at a glance- The UDDI Business registry- UDDI under the covers – Accessing UDDI- How UDDI is playing out.

UNIT III

Conversations: Overview –Web services Conversation Language – WSCL Interface components – The Bar scenario conversations – Relationship between WSCL and WSDL Workflow: **Business Process Management – Workflow and Workflow management systems.**

UNIT IV

Transactions: ACID Transactions – Distributed Transactions and two phase commit – Dealing with Heuristic outcomes – Scaling transactions to web services – OASIS business transaction protocol – Other web services transaction Protocol .

UNIT V

Security: Everyday security basis – Security is an end to end product – Web service security issues – Types of Security attacks and threats - Web services security road map WS – Security.

EMPLOYABILITY

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Get an idea on Processing XML.

- Understand the concepts of SOAP, UDDI.
- Understand the concepts of Web security.

REFERENCES:

1. Developing Enterprise Web Services - An Architect's Guide – Sandeep Chatterjee, James Webber, Pearson Education– Second Indian Reprint 2005.
2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education, First Indian Reprint 2005.

20222SEC25L	Python Programming Lab	0	0	3	2
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1. Find the square root of a number (Newton's method)
2. Exponentiation (power of a number)
3. Find the maximum of a list of numbers
4. Linear search and Binary search
5. Selection sort, Insertion sort
6. Merge sort

7. First n prime numbers
8. Multiply matrices
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file

EMPLOYABILITY

Course Outcomes:

Duck typing and huge standard library

Presence of third-party modules.

Express proficiency in the handling of strings and functions.

Extensive support libraries(NumPy for numerical calculations, Pandas for data analytics etc).

Open source and community development.

To write programs for a wide variety problem in mathematics, science, and games.

20222SEC26L	Open Source programming Lab	0	0	3	2
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1. Prepare a web page in ASP which displays course submission form using objects.
2. Write a program for addition using VBScript.
3. Write a program for finding maximum number using JavaScript.
4. Develop a web page which display window shrinking using JavaScript
5. Write a program in JavaScript a)OnMouse move b)OnMouse out.
6. Write a Perl script using array find element in list.
7. Write a Perl script for simple manipulation.
8. Develop a PHP program and check message passing mechanism between pages.
9. Develop a PHP program to display student information using MYSQL table.

10. Develop a college application form using MYSQL table.

EMPLOYABILITY

Course Outcomes:

- Understand process of executing a PHP-based script on a webserver.
- Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
- Understand basic PHP syntax for variable use, and standard language constructs, such as conditionals and loops.
- Understand the paradigm for dealing with form-based data, both from the syntax of HTML forms, and how they are accessed inside a PHP-based script.
- To understand the role and future of open source software in the industry along with the impact of legal, economic and social issues for such software.

20222DSC27A	Discipline Specific Elective – II GAME PROGRAMMING	5	0	0	4
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OBJECTIVES:

- To get subsequent understanding of game design and development, which includes the processes, mechanics, issues in game design, game engine development, modeling, techniques, handling situations, and logic.
- To create interactive games

UNIT I BASICS FOR GAME PROGRAMMING

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation.

UNIT II GAME DESIGN PRINCIPLES & THEORY

Game Logic, Game AI, Path Finding, Game Theory, Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection.

UNIT III GAMING ENGINE REQUIREMENT & DESIGN

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity.

UNIT V GAME DEVELOPMENT ENVIRONMENT

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, and Multi Player games.

EMPLOYABILITY

OUTCOMES:

- Illustrate an understanding of the concepts behind game programming techniques.
- Implement game programming techniques to solve game development tasks.
- Construct a basic game engine using open-source programming libraries.

REFERENCES:

1. Andy Harris, “Beginning Flash Game Programming For Dummies”, For Dummies; Updated Edition, 2005.
2. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” Morgan Kaufmann, 2nd Edition, 2006
3. Dino Dini, “Essential 3D Game Programming”, Morgan Kaufmann, 1st Edition, 2012
4. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, Prentice Hall 1st Edition, 2006
5. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2011
6. Jason Gregory, “Game Engine Architecture”, A K Peters, 2009.
7. JungHyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 1st Edition, 2011
8. Mike McShaffrly, “Game Coding Complete”, 3rd Edition, Charles River Media, 2009.
9. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3rd Edition, 2009
10. Jeannie Novak, “Game Development Essentials”, 3rd Edition, Delmar Cengage Learning, 2011.
11. John Hattan, “Beginning Game Programming: A GameDev.net Collection”, Course Technology PTR, 1st Edition, 2009
12. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, “Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer”, 1st Edition, Wiley, 2007.
13. Roger E. Pedersen, “Game Design Foundations”, Edition 2, Jones & Bartlett Learning, 2009.
14. Scott Rogers, “Level Up!: The Guide to Great Video Game Design”, Wiley, 1st Edition, 2010.

20222DSC27B	Discipline Specific Elective – II Multimedia and Graphics	5	0	0	4
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AIM

To impart the fundamental concepts of Multimedia and Graphics.

OBJECTIVES

- To study the multimedia concepts and various I/O technologies.
- To study the graphics techniques and algorithms.
- To enable the students to develop their creativity

UNIT I

Introduction – Definition- Multimedia Hardware- Multimedia Software- MULTIMEDIA networking- Multimedia Applications- Multimedia Environments- Multimedia Computer Components- Multimedia Standards- Multimedia PC.

UNIT II

Multimedia Software : Basic Tools : Text Editing and Word Processing Tools – OCR Software – Painting and Drawing Tools – 3-D Modeling and Animation Tools – Image-Editing Tools – Sound Editing Tools – Animation, Video, and Digital Movie Tools – Helpful Accessories. Making Instant Multimedia : Linking Multimedia Objects – Office Suites - Word Processors – Spreadsheets – Databases – Presentation Tools – Multimedia Authoring Tools – Types of Authoring Tools – Card and Page-Based Authoring tools – Icon –Based Authoring tools – Time Based Authoring tools- Object – Oriented Authoring tools – Gross platform Authoring Notes.

UNIT III

Multimedia Building blocks : Text : The Power of Meaning – About fonts and Faces Using Text in Multimedia – Computers and Text – Font Editing and Design Tools – Hypermedia and Hypertext. Sound: The Power of Sound – Multimedia System Sounds – MIDI versus Digital Audio – Making MIDI Audio – Audio File Formats –Working with Sound on the Macintosh –

Toward Professional sound – Production Tips. Images: – Making Still Images – Color – Image File formats. Computer Animation - Using Digital Video in Multimedia Applications.

UNIT IV

Computer Graphics and output primitives: Concepts and applications, Random and Raster scan devices, Refresh Cathode ray tubes, LCD monitors, Laser, Printers, Keyboards, Mouse, Scanners, Graphics Software output primitives: Line drawing algorithm: DDA along with Bresenhan’s. Circle generating algorithm, Midpoint algorithms: ellipse and other curves.

UNIT V

Two-dimensional Transformations: Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinates composite transformation. Three dimensional concepts: 3D Display methods- parallel projection, perspective projection, Depth cueing. Three dimensional object representations: Polygon Surface, Tables, Plane Equation.

EMPLOYABILITY

OUTCOMES:

- Gain proficiency in 3D computer graphics API programming
- Enhance the perspective of modern computer system with modeling, analysis and interpretation of
- 2D and 3D visual information.
- Able to understand different realizations of multimedia tools
- Able to develop interactive animations using multimedia tools
- Gain the knowledge of different media streams in multimedia transmission

REFERENCES:

1. Tay Vaughan, “Multimedia making it work”, 4th Edition Tata McGraw – Hill Edition, 2000. (For Unit –I, II, III, Chapters-1,2,3,4).
2. Donald Hearn M. Paulin Baker “ Computer Graphics” 1992 , PHI (For Unit –IV &V, Chapters-3, 5, 9).
3. Willam M. Newman , Robert F. Sproull “ Principles of Interactive Graphics” 1979 McGraw Hill.

20222DSC27C	Discipline Specific Elective – II MIDDLEWARE TECHNOLOGIES	5	0	0	4
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AIM :

To understand the design and implementation of a simple compiler.

OBJECTIVES:

The main objective of the course is to create a practical, wide-ranging discussion on Middleware Technologies to help students understand what is going on so they can pick out the real issues from the imaginary issues and start building complex distributed systems with confidence. Upon completion of this course the students will be able to

- Understand Distributed systems design and implementation
- Understand existing Distributed Technologies
- Use Middleware to Build Distributed Applications
- Understand Middleware Interoperability
- Understand Web services architectures Course

UNIT I INTRODUCTION

Emergence of Middleware – Objects, Web Services – Middleware Elements – Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction-Oriented Middleware – MOM – RPC.

UNIT II OBJECT ORIENTED MIDDLEWARE

OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI – COM+.

UNIT III COMPONENT OBJECT RESOURCE BROKER ARCHITECTURE (CORBA)

Naming – Trading – Life Cycle – Persistence – Security – CORBA.

UNIT IV WEB SERVICES

Introduction – XML Web Services standards – Creating Web Services – Extending Web Services – Messaging Protocol – Describing – Discovering – Securing.

UNIT V OTHER TYPES OF MIDDLEWARE

Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware.

EMPLOYABILITY

Outcomes:

At the end of the course the student will be able to

- Learn how to use Middleware to Build Distributed Applications
- Implement Business Processes
- Learn about MiddleWare Technologies
- Implement Business Processes
- Learn application design and IT architecture

REFERENCES BOOKS

1. Chris Britton and Peter Eye, “IT Architecture and Middleware”, Pearson Education, 2nd Edition, 2004.
2. Wolfgang Emmerich, “Engineering Distributed Objects”, John Wiley, 2000.
3. Keith Ballinger, “.NET Web Services – Architecture and Implementation”, Pearson Education, 2003. (Unit IV).
4. Qusay H. Mahmoud, “Middleware for Communications”, John Wiley and Sons, 2004.
5. Gerald Brose, Andreas Vogel, Keith Duddy, “Java™ Programming with CORBA™: Advanced Techniques for Building Distributed Applications”, Wiley, 3rd edition, January, 2004.
6. Michah Lerner, “Middleware Networks: Concept, Design and Deployment of Internet Infrastructure”, Kluwer Academic Publishers, 2000.

20222RMC28	Research Methodology	3	0	0	2
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AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in MATLAB platform for basic computational programming and analysis.

OUTCOME:

Ability to develop research questions and the various research strategies and compile research results in terms of journal manual scripts.

PREREQUISITES:

Research methodology course in UG level or equivalent knowledge.

UNIT-I Introduction to research methodology

Objectives of research – type of research – Significance of research. Research methodology – Research and scientific method – Criteria of good research – Problems encountered by research in India.

UNIT-II Data base and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts –Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT-III Data Analysis:

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors –normal distribution curve – Statistical treatment of finite samples – T test and F test (ANOVA) co – Variance (ANCOVA) correlation and multiple regression.

UNIT-IV Thesis and paper writing:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – Reference and Appendices.

UNIT-V Application on MATLAB:

Numerical Integration – Numerical integration, ordinary differential equations, partial differential equations, and boundary value problems - Fourier analysis – Fourier transforms, convolution.

EMPLOYABILITY**References:**

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi,2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

SEMESTER III

20222SEC31	Data mining and warehousing	6	1	0	5
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AIM:

To emphasis on the design aspects of Data mining and Data Warehousing.

OBJECTIVES:

- To introduce the concept of Data Mining with in detail coverage of basic tasks metrics issues and implication .Core topics like classification, clustering and association rules are exhaustively dealt with.
- To introduce the concept of Data Warehousing with special emphasis on architecture and design.

UNIT I

Introduction: Data mining-data mining functionalities-clasification-Task Primitives-Data processing: data cleaning-data integration and transformation-data reduction-data discretization and concepts.

UNIT II

Data mining concepts: Efficient and scalable mining methods-various kinds of association rules- from association mining to correlation analysis-constraint based association mining.

UNIT III

Classification and prediction: classification by decision tree-Bayesian classification-classification by backpropagation-prediction. Cluster analysis: types of data in Cluster analysis-partitioning methods –hierarchical methods.

UNIT IV

Data ware house: What is data warehousing-Multidimensional data model-data ware house architecture-Dataware house implementation-From data ware housing to data mining.

UNIT V

Multidimensional analysis: spatial data mining-Multimedia data mining-Text mining-Mining and world wide web-Data mining applications

EMPLOYABILITY

OUTCOMES:

After completing this course, the student will be able to:

- Apply data mining techniques and methods to large data sets.
- Use data mining tools
- Compare and contrast the various classifiers.

REFERENCES:

1. Data Mining concept & Techniques”, Jiaweri Han & Micheline , Morgan kauffman publications –2000.
2. “Data warehouse project mangement” sid Addman & Larissa T.moss, Addison

20222SEC32	Grid and Cloud Computing.	6	1	0	4
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AIM

To understand the technology application and tool kits for grid computing and to provide a strong foundation in Developing Cloud Services.

OBJECTIVES

- To understand the genesis of grid computing.
- To know the application of grid computing.
- To understand the technology and tool kits to facilitate the grid computing
- To understand the concept of Cloud Computing.
- To get an idea about Sharing Files

UNIT I

Introduction - Definition - Scope of grid computing

UNIT II

Grid Computing Organizations and their roles – Grid Computing analog – Grid Computing road map

UNIT III

Understanding Cloud Computing: An introduction to Cloud Computing – Computing in the Cloud – Developing Cloud Services.

UNIT IV

Cloud Computing for the Family – Cloud Computing for the Community – Cloud Computing for the Corporation

UNIT V

Collaborating via Web-Based Communication Tools – Collaborating via Social Networks and Groupware – Collaborating Via Blogs and Wikis

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to

- Use the grid and cloud tool kits.
- Design and implement applications on the Grid.
- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Design Cloud Services and Set a private cloud

REFERENCES:

1. Joshy Joseph & Craig Fellenstein, “Grid Computing”, PHI, PTR-2003.
2. Ahmar Abbas, “Grid Computing: A Practical Guide to technology and Applications”, Charles River media – 2003.
3. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson, 2009

20222SEC33	.NET Programming	5	0	0	4
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AIM

To cover the fundamental concepts of the .NET framework.

OBJECTIVES

- To gain knowledge in the concepts of the .NET framework and its technologies.
- To get experience in building sample applications of large-scale projects.

UNIT I

Visual basic.NET and the .NET Framework –The elements of Visual Basic .NET

UNIT II

Visual Basic .NET operators-software Design, conditional structures, and controls Flow-Methods.

UNIT III

Interfacing with the End user-Asp.NET Applications.

UNIT IV

Web Form Fundamentals – Web Controls – Validation and Rich Controls.

UNIT V

ADO.NET Data Access – Data Binding –Data List, DataGrid, and Repeater.

EMPLOYABILITY

OUTCOMES:

- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio.
- Utilize the .NET environment to create Web Service-based applications and components.

REFERENCES:

1. The Complete Reference VB.NET – Jeffrey R-Shapiro- Tata McGrawHill Edition
2. The Complete Reference ASP.NET- Matthew MacDonald- Tata McGrawHill Edition
3. Visual Basic .Net Programming -Bible.

4. Visual Basic.Net Black Book- Steven Holzner.

20222SEC34	Object Oriented System Design	5	0	0	4
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AIM

To understand the concepts of object oriented analysis and design.

OBJECTIVES

- To understand the object oriented life cycle.

- To know how to identify objects, relationships, services & attributes through UML.
- To understand the use-case diagrams.
- To know the Object Oriented Design process.
- To know about software quality and usability.

UNIT I

Introduction: an overview of object oriented system development object basics-object oriented system development life cycle.

UNIT II

Methodology, modeling, & unified modeling language: object-oriented methodologies-UML.

UNIT III

Object-oriented analysis: object –oriented analysis process. Identifying use case –object analysis classification identifying object relation, attribute & methods.

UNIT IV

Object oriented designing: the object oriented designing process & design axioms- designing classes – access layer.

UNIT V

View layer –software Quality assurance- system usability & measuring user & satisfaction.

EMPLOYABILITY

OUTCOMES:

- Understand the basic concepts to identify state & behavior of real world objects
- Able to learn the various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies
- Understand the concept of analysis, design & testing to develop a document for the project
- Able to implement analysis, design & testing phases in developing a software project

- Able to understand the testing strategies and know about automated testing tools

REFERENCES:

- 1."Object Oriented System and Development" by Alibahrami, mc Graw –hill international edition.
2. "The Unified Modeling Language User Guide". - Grady Boocu, James Rambaugh and Ivar Jacobson
3. Instant UML – Pierre- Alain Muller- Wrox Press Ltd., Shroff Publishers and Distributors Pvt. Ltd.,

20222SEC35L	.NET Programming Lab.	0	0	3	2
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1. Write a program in VB. Net to check whether given number is Odd or Even.
2. Write a program to find maximum from given numbers.
3. Write a program to find are of a circle
4. Design ASP.Net web form using Html Server Controls to enter job seeker's details.
5. Create an ASP.Net web form using Web control to enter E-Mail registration form.
6. Apply appropriate validation techniques in E-Mail registration form using
7. Validation controls.
8. Write an ASP.Net application to retrieve form data and display it the client browser in a table format.
9. Create a web application using ADO.Net that uses which performs basic data Manipulations:
(i). Insertion (ii) Updating (iii) Deletion (iv) Selection
Hint: Do operations using Ms-Access and SQL-Server
10. Create an application using Data grid control to access information's from table in SQL server.

EMPLOYABILITY

Outcomes:

- It provides re-usability.
- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- develop menu based program for text manipulation.
- Utilize the .NET environment to create Web Service-based applications and components.
- Less Coding and Increased Reuse of Code: This framework works on object-oriented programming which eliminates unnecessary codes and involves less coding for the developers.

2022DSC36A	Discipline Specific Elective – III Information Security	5	0	0	4
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AIM

To study the critical need for ensuring Information Security in Organizations

OBJECTIVES

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT I INTRODUCTION

History, what is Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III SECURITY ANALYSIS

Risk Management : Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV LOGICAL DESIGN

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799 / BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control

Devices, Physical Security, Security and Personnel

EMPLOYABILITY

Outcomes:

- Securing confidential information.
- Protection from malicious attacks on your network.
- Develop an understanding of security policies.
- Deletion and/or guaranteeing malicious elements within a preexisting network.
- Prevents users from unauthorized access to the network.

REFERENCES

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003
2. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”,Vol 1-3 CRC Press LLC, 2004.
3. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2003
4. Matt Bishop, “ Computer Security Art and Science”, Pearson/PHI, 2002.

20222DSC36B	Discipline Specific Elective – III Internet of Things	5	0	0	4
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OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario

UNIT I INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT II IoT ARCHITECTURE

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi – Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

EMPLOYABILITY

OUTCOMES:

- Upon completion of the course, the student should be able to:
- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Raspberry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
3. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012

20222DSC36C	Discipline Specific Elective – III M-Marketing	5	0	0	4
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OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

EMPLOYABILITY

OUTCOMES

- Upon Completion of the course, the students should be able to:

- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge University Press, 2001.

SEMESTER IV

20222SEC41	Human Computer Interaction.	6	0	0	4
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AIM:

To have a thorough knowledge about Human Computer Interaction.

OBJECTIVES

- To understand the concept of HCI Ergonomics and WIMP interface.
- To learn about Heuristic process and Evaluation techniques.

UNIT I

The interaction: Introduction - Models of interaction - Frameworks and HCI - Ergonomics - Interaction Styles - Elements of WIMP interface - Interactivity - The Context of the interaction - Paradigm: Introduction - Paradigms for interaction.

UNIT II

Interaction Design basics: Introduction - what is design? - User focus - Scenarios - Navigation design - Screen design and layout - Interaction and prototyping - HCI in the software process: Introduction - The software lifecycle - Usability engineering – interactive design and prototyping – Design rationale.

UNIT III

Design rules: Introduction - Principles to support usability - Standards – Guidelines-Golden rules and heuristics - HCI patterns - Implementation Support: Introduction -elements of windowing systems - Programming the application - Using toolkits- User interface management systems.

UNIT IV

Evaluation techniques: What is evaluation - Goals of evaluation - Evaluation through expert analysis - Evaluation through user participation - Choosing an evaluation method - Universal Design: Introduction - Universal design principles - Multi-modal interaction - Designing for diversity.

EMPLOYABILITY

OUTCOMES:

Upon completion of the course, the student should be able to:

- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites.

REFERENCES:

1. "**Human-computer Interaction**" - Alan Dix - Pearson Education - 2004.

20222SEC42	Software Project Management	6	0	0	4
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UNIT I INTRODUCTION TO PROJECT MANAGEMENT

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT III ACTIVITY PLANNING

Objectives – Project Schedule – Sequencing And Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity On Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT IV MONITORING AND CONTROL

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS

Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman–Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

EMPLOYABILITY

Course Outcomes:

Apply project management concepts and techniques to an IT project.

Identify issues that could lead to IT project success or failure.

Explain project management in terms of the software development process.

Explain the quality management & different types of metrics used in software development.
Describe the responsibilities of IT project managers.

REFERENCES:

1. Bob Hughes and MikeCotterell “Software Project Management”, Third Edition, TATA McGraw Hill Edition 2004.
2. Ramesh, Gopaldaswamy: "Managing Global Projects ", Tata McGraw Hill, 2001.
3. Royce.” Software Project Theory”, Pearson Education, 1999.
4. P.Jalote “Software Project Management In Practice”, Pearson Education, 2000.

20222SEC43	Big Data	6	0	0	5
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OBJECTIVES:

- ❖ To explore the fundamental concepts of big data analytics
- ❖ To learn to analyze the big data using intelligent techniques.
- ❖ To understand the various search methods and visualization techniques.
- ❖ To learn to use various techniques for mining data stream.
- ❖ To understand the applications using Map Reduce Concepts.

UNIT I INTRODUCTION TO BIG DATA

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II MINING DATA STREAMS

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III HADOOP

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV HADOOP ENVIRONMENT

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance- Hadoop benchmarks- Hadoop in the cloud

UNIT V FRAMEWORKS

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

EMPLOYABILITY

OUTCOMES:

- The students will be able to:
- Work with big data platform
- Analyze the big data analytic techniques for useful business applications.
- Design efficient algorithms for mining the data from large volumes.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Explore on Big Data applications Using Pig and Hive
- Understand the fundamentals of various bigdata analysis techniques

REFERENCES

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012
4. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
6. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
7. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
8. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

9. Da Ruan, Guoqing Chen, Etienne E. Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007
10. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

20222PRW44	Project work	0	0	15	10
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Each student will develop and implement individually developed application software based on any of the latest technologies.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.C.A., curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	2
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	2
IV	Project Work	10

Blueprint for assessment of student’s performance in Research Led Seminar Course

- Internal Assessment:** **40 Marks**
- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks

- Literature Survey : 10 Marks
- Semester Examination : 60

Marks

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Socio Technical Project

- Continuous Internal Assessment through Reviews: 40 Marks**
- Review I : 10 Marks
- Review II : 10 Marks
- Review III : 20 Marks
- Evaluation of Socio Technical Practicum Final Report: 40 Marks**
- Viva- Voce Examination: 20 Marks**
- Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment: 20 Marks

- Research Tools(Lab) : 10 Marks
- Tutorial: 10 Marks

Model Paper Writing: 40 Marks

- Abstract: 5 Marks
- Introduction: 10 Marks
- Discussion: 10 Marks
- Review of Literature: 5 Marks
- Presentation: 10 Marks

Semester Examination: 40 Marks

Total: 100 Marks



SCHOOL OF ARTS & SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
M.Sc., (Computer Science)

Graduate Attributes :

- Information Literacy
- Problem Analysis
- Design/development of solutions
- Modern tool usage
- Professional and Ethical understanding

Program Objectives (Po):

- PO1:** To apply and continuously acquire knowledge, both theoretical and applied, related to core areas of computer science.
- PO2 :**To demonstrate the ability to work effectively as a team member and/or leader in an ever-changing professional environment.
- PO3 :**To work productively as computer professionals (in traditional careers, graduate school, or academia) by: demonstrating effective use of oral and written communication, working competently as a member of a team unit, adhering to ethical standards in the profession.

Program Outcomes (POs)

- PO1:**To communicate computer science concepts, designs, and solutions effectively and professionally;
- PO2:**To apply knowledge of computing to produce effective designs and solutions for specific problems;
- PO3:** To identify, analyse, and synthesize scholarly literature relating to the field of computer science;
- PO4:**To use software development tools, software systems, and modern computing platforms.
- PO5:**To an understanding of professional, ethical, legal, security and social issues and responsibilities
- PO6:**To do capable of evaluating personal and professional choices in terms of codes of ethics and ethical theories and understanding the impact of their decisions on themselves, their professions, and on society
- PO7:** To apply design and development principles in the construction of software systems of varying complexity.

Program Specific Outcomes (PSO)

- PSO1:** Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.
- PSO2:** Understanding the structure and development methodologies of software systems. Possess professional skills and knowledge of software design process. Familiarity and practical competence with a broad range of programming language and open source platforms.
- PSO3:** Acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

Course Outcomes:

CO1 -J2EE programming:

- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

CO2 -Relational Data Base Management System:

- Identify what students will know and be able to do if they master the material.
- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations.
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.

CO3 -Discrete Mathematics:

- The common 2-year sequence works well for many disciplines.
- Topics can be introduced "just-in-time" for many disciplines.
- Since all students take the same sequence, advising is relatively easy
- Ability study of **mathematical structures** that are countable or otherwise distinct and separable.
- Examples of **structures** that are **discrete** are combinations, graphs, and logical statements. **Discrete structures** can be finite or infinite.

CO4 -J2EE programming Lab:

- The students able to Design and develop GUI applications using Abstract Windowing Toolkit (AWT)
- Swing and Event Handling
- Web applications and Designing
- Enterprise based applications for business logic
- In depth manual testing teaching with case studies.
- Programmer training by creating standardized, reusable modular components and by enabling the tier to handle many aspects of programming automatically.

CO5 :RDBMS Lab:

- The students able to Design and develop Normalize a database

- Can Declare and enforce integrity constraints on a database using a state-of-the-art.\
- Programming PL/SQL including stored Procedures.
- Can Design GUI applications
- Sharing of data and data integrity.
- Reducing Data Redundancy.

Discipline Specific Elective I:

CO6 : a) WAP & XML:

- To Identify advance concepts of **WAP browser** for mobile devices such as mobile phones that uses the mobile protocol.
- XML/WML** is used to design wap pages for mobile devices.
- To develop a animated GIF, Java AWT, Frames, ActiveX Controls, Shockwave, movie clips, audio.
- To Designed for large bandwidth (compared to wireless access) and low delay

CO7: b) Computer Architecture:

- Analyze processor Performance improvement using instruction level parallelism.
- Learn the function of each element of a memory hierarchy.
- Study various data transfer techniques in digital computer.
- Articulate design issues in the development of processor or other components that satisfy design requirements and objectives.
- Learn microprocessor architecture and study assembly language programming

CO8: Research Led Seminar:

- It is clear that the lowest value the students place on the link between *research* and teaching is that research led teaching .
- Helps develop skills in data collection and complex analysis.
- This in turn being connected with technical, procedural and theoretical learning *outcomes* at the required level.
- Promoting the values of enquiry and deep approaches to learning.
- The motivation and development of students as a consequence of exposure to expert subject matter.

CO9 : Python Programming:

- Presence of Third Party Modules.
- Extensive Support Libraries.
- Open Source and Community Development
- Able to determine the methods to create and manipulate **Python** programs.
- Can Identify the commonly used operations involving file systems and regular expressions

CO10: Cryptography & Network Security:

- Develop basic skills of secure **network** architecture and explain the theory behind the **security** of different **cryptographic** algorithms.
- Describe common **network** vulnerabilities and attacks, defence mechanisms against **network** attacks, and **cryptographic** protection mechanisms.
- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

CO11 :Software Engineering:

- Graduates of the *program* are expected to demonstrate the problem
- An ability to identify, formulate, and solve complex *engineering* problems by applying principles of *engineering*, science, and mathematics.
- To Explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To Understand the nature of software life cycle.

CO12 Python Programming Lab:

- Able to determine the methods to create and manipulate Python programs.
- By utilizing the data structures like lists, dictionaries, tupelos and sets.
- Identify the commonly used operations involving file systems and regular expressions
- Duck typing and huge standard library
- Presence of third-party modules.
- Extensive support libraries(NumPy for numerical calculations, Pandas for data analytics etc).

CO13 UNIX Lab:

- To introduce Basic Unix general purpose Commands
- To learn network Unix commands.
- To learn C programming in Unix editor environment.
- To learn shell script and sed concepts.
- To learn file management and permission advance commands.
- To learn awk, grap, perl scripts.

Discipline Specific Elective II:

CO14 a)Operating Ststem:

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To Understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.

CO15 b)Artificial Intelligence:

- To impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing
- To introduce advanced topics of AI such as planning, Bayes networks,
- Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
- Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
- Formulate and solve problems with uncertain information using Bayesian approaches.

CO16: Research Methodology:

- These students able to demonstrate knowledge of **research** processes (reading, evaluating, and developing)
- Can identify, explain, compare, and prepare the key elements of a **research** proposal/report.
- To compare and contrast quantitative and qualitative **research** paradigms
- Ability to develop research questions and the various research strategies
- Compile research results in terms of journal manual scripts

CO17 Participation in Bounded Research:

- To understand the general definition of research design.
- To be able to identify the overall process of designing a research study from its inspection to its report.
- Familiar with how to write a good introduction to an education, research study and the components that comprise such an introduction.
- To know the type of descriptive statistics typically reported in educational research studies.
- Able to identify a research problem stated in a study.

CO18 Open Source programming:

- Develop **open source programming** products which are normally free to download, although it does incur running costs such as storage and computing power.
- Even those rare paid-for **open source** products still tend to be far cheaper than closed **source** alternatives
- Understand process of executing a PHP-based script on a webserver.
- Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
- Understand basic PHP syntax for variable use, and standard language constructs, such as conditionals and loops

CO19 .Net Programming:

- To demonstrate advanced knowledge of networking understands the key protocols which support the Internet.
- Be familiar with several common **programming** interfaces for **network** communication.
- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio.

- Utilize the .NET environment to create Web Service-based applications and components.

CO20 .Net Programming Lab:

- The students are able to develop *programs* using *C#* based on object oriented concepts
- Write the ROBUST, EXTENSIBLE and EFFICIENT *programs* by using *c#* code and ASP.Net
- Create dynamic web pages for further development.
- It provides re-usability.
- Less Coding and Increased Reuse of Code:

CO21 Open Source programming Lab:

- These students able to develop efficient open source programmes for rapidly developing network world
- Reliability and auditability.
- Integrated management.
- Simple license management

Discipline Specific Elective III

CO22 Wireless communication Network:

- These students able to understand and develop wireless communication and its infrastructure.
- Understand design considerations for wireless communication networks
- Understand the fundamentals of wireless networks.
- Learn and analyze the different wireless technologies.
- Evaluate Ad-hoc networks and wireless sensor networks.
- Understand and evaluate emerging wireless technologies and standards

CO23 Real time Operating System:

- Ability to estimate if a system takes distributed system characteristic into account in a reasonable way.
- Knowing the basic structures (e.g. client-server) and knowing the existing middleware frameworks.
- Ability to estimate framework suitability for different applications.
- Ability to implement a simple distributed software laboratory work with socket and RMI interfaces.
- Understanding the mathematical principles behind validity of algorithms solving the problems of distribution.
- Understanding the problems that will arise if atomicity and timing issues are not handled in a distributed application.

CO24 Societal project (Mini Project):

- These students will learn to real world project developing skill.
- Group discussion.
- Cost effective development
- Breaking problem
- Reassembling problem

CO25 Internship:

- Develop communication, interpersonal and other critical skills in the job interview process.
- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function in the economy.
- Develop work habits and attitudes necessary for job success.

CO26 Software Testing:

- Apply modern **software testing** processes in relation to **software** development and project management.
- Create **test** strategies and plans, design **test** cases, prioritize and execute them.
- To develop, implement black box and white box testing cases.
- To understand use of Flow graphs and computing cyclomatic complexity using various methods.
- To understand and implement Automated software testing techniques for Web testing, Performance testing, and GUI testing.
- To develop, implement, and demonstrate the learning through a project that meet stated specifications.

CO27 Human Computer Interaction:

- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites
-

Discipline Specific Elective IV:

CO28 a) Multimedia And Its Application:

- To customize the specific parts of the Multimedia Applications (Power Point) software.
- To prepare visuals by making arrangements on the slide master, and placeholders, etc.
- An understanding of multimedia development in the business world, and how successful development is contingent on detailed client specifications, user and audience research, and design decisions taken during the planning phase.
- An understanding of the content of learning materials available from e-skills UK and how these can be used with learners to develop multimedia products
- To work with learners to plan and create a multimedia product that includes animation, audio and video

CO29 b) Middleware technology:

- In business, it helps streamline processes and improves efficiency in terms of organization.
- It facilitates communication between systems,
- It is able to maintain the integrity of information across a multitude of systems within a network.
- Understand Middleware Interoperability.

CO30 Project work:

- Can be able to develop plans with relevant people to achieve the **project's** goals.
- Break **work** down into tasks and determine handover procedures.
- Identify links and dependencies, and schedule to achieve deliverable handover

Estimate and cost the human and physical resources required, and make plans to obtain the necessary resources.

It supports students to show their talent.

CO31 Program Exit Examination:

The exam is supposed to measure the learning outputs of the program as a whole not a individual course.

The primary purpose of the exit exams is to assess students' educational achievement in the courses in their major area of program study.

The exam is supposed to measures the learning outputs of the program as a whole not the individual courses.



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

DEPARTMENT OF COMPUTER SCIENCE

M.Sc., (Computer Science)

COURSE STRUCTURE – 2020R

Semester I

Course Code	Course Title	L	T	P	C
	Semester I				
20220SEC11	J2EE Programming	6	0	0	4
20220SEC12	RDBMS	6	0	0	4

20212SEC13	Discrete Mathematics	6	0	0	4
20220SEC14L	J2EE programming Lab	0	0	3	2
20220SEC15L	RDBMS Lab	0	0	3	2
20220DSC16_	Discipline Specific Elective - I	6	0	0	4
20220RLC17	Research Led Seminar	-	-	-	1
	Total	24	0	6	21

Semester II

Course Code	Course Title	L	T	P	C
20220SEC21	Python Programming	5	0	0	4
20220SEC22	Cryptography & Network Security	5	0	0	4
20220SEC23	Software Engineering	5	0	0	4
20220SEC24L	Python Programming Lab	0	0	3	2
20220SEC25L	UNIX Lab	0	0	3	2
20220DSC26_	Discipline Specific Elective – II	5	0	0	4
20220RMC27	Research Methodology	4	0	0	2
20220BRC28	Participation in Bounded Research	-	-	-	2
	Total	24	0	6	24

Semester III

Course Code	Course Title	L	T	P	C
20220SEC31	Open Source programming	6	0	0	6
20220SEC32	.Net Programming	6	0	0	5
20220SEC33L	Open Source programming Lab	0	0	3	2
20220SEC34L	.Net Programming Lab	0	0	3	2
20220DSC35_	Discipline Specific Elective – III	5	0	0	4
202__OEC	Open Elective Course	4	0	0	3
20220SRC37	Societal project (Mini Project)	0	0	0	2

	Total	21	0	6	24
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Semester IV

Course Code	Course Title	L	T	P	C
20220SEC41	Software Testing	6	0	0	6
20220SEC42	Human Computer Interaction	6	0	0	5
20220DSC43_	Discipline Specific Elective - IV	4	0	0	4
20220PRW44	Project work	0	0	0	10
20220PEE	Programme Exit Examination	-	-	-	2
	Total	14	0	0	27
	Total credits for the program				96

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	a) 20220DSC16A - WAP and XML b) 20220DSC16B - Advanced Computer Architecture
II	a) 20220DSC26A - Artificial Intelligence b) 20220DSC26B - Distributed Operating System
III	a) 20220DSC35A - Real time Operating Systems b) 20220DSC35B - Wireless Communication Network
IV	a) 20220DSC43A - Multimedia and its application b) 20220DSC43B - Middleware Technology

Open Electives

Semester	Open Elective Courses
	a) 202ENOEC – Writing for the Media b) 202MAOEC-Applicable Mathematics Techniques c) 202PHOEC-Bio-medical Instrumentation

III	d)	202CHOEC-Green Chemistry
	e)	202BCOEC-Herbal Medicines
	f)	202CMOEC- Financial Service
	g)	20280OEC-Counselling and Psychology

CREDIT DISTRIBUTION

SEMESTER	AEC	SEC	DSC	OEC	RESEARCH	OTHERS	TOTAL
I	4	12	4		1		21
II		16	4		4		24
III		15	4	3	2		24
IV		11	4		10	2	27
TOTAL	4	59	12	2	15	2	96

20220SEC11	J2EE Programming	6	0	0	4
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AIM:

To enable the students to develop standalone programming and Internet based application

OBJECTIVES:

- To learn java programming concepts under Client Sever environment
- To develop Database Application in Java .
- To learn java programming concepts like reflection, native code interface, threads etc
- To develop network programs in java.
- To understand concepts needed for distributed and multi-tier applications.
- To understand issues in enterprise application development.

UNIT I

Fundamentals of OOPS-Overview of java language-Data type-Variables and arrays-Class Fundamentals-declaring objects-constructor-overloading methods-inner classes-method overriding.

UNIT II

Applet class-Applet architecture-Html applet tag-Passing parameters in applet-AWT classes-Window fundamentals-AWT controls- Handling events by extending AWT components.

UNIT III

Java Database Connectivity: JDBC/ODBC Bridge-The connectivity model being used-The java.sql Package-The JDBC Exception Classes- JDBC working with user interface-Database connectivity- Data manipulation-Data Navigation-Data Storage.

UNIT IV

RMI: What is Distributed Object System? -Distributed object Technologies-RMI for distributed computing-RMI Architecture- RMI Registry service-Creating RMI Applications-Steps involved in running the RMI Applications-Removing objects from a Registry.

UNIT V

Java and XML: Generating an XML Document- Java Servlets- Java Server Pages

EMPLOYABILITY

Outcomes:

- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.

- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

REFERENCES:

1. “JAVA2 COMPLETE REFERENCE” Fourth Edition, 2001, Herbert Schildt.

(For UNIT- I & II: Chapters 2, 3, 6, 7, 8, 19, 21, 22)

2. WEB ENABLED COMMERCIAL APPLICATION DEVELOPMENT USING....JAVA 2.0-IVAN BAYROSS.

(For UNIT III& IV: Chapters 11, 13).

3. THE COMPLETE REFERENCE J2EE - KEOGH

(For UNIT – V: Chapters 9, 10, 11)

20220SEC12	RDBMS	6	0	0	4
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AIM :

To provide an in-depth knowledge of Relational database system using Oracle.

OBJECTIVES:

- To understand about SQL Queries.
- To learn about Oracle Web Application.
- To impart knowledge in transaction processing, concurrency control techniques and recovery Procedures.

UNIT-I

Introduction- File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Introduction Relational Model and E-R model.

UNIT-II

Introduction to SQL - Basic structure and Basic operations of SQL – Set operations - Aggregate functions – Nested queries – Join expressions and views–Functions and procedure – Triggers

UNIT-III

Relational query languages - Relational algebra – Tuple relational calculus – Domain relational calculus – Relational database design - Functional dependency – Normalization – 1NF,2NF,3NF and BCNF

UNIT-IV

Transaction management - Transaction Processing –Properties of Transactions - Serializability – concurrency control lock based protocols – Deadlock handling Time Stamp based protocol - Validation Techniques - Recovery system - Log Based Recovery.

UNIT-V

Data base System Architecture – Centralized client-server Architecture- Server system Architecture – Parallel Data bases – Distributed data bases – Distributed Data storage – Distributed transaction – commit protocol – Concurrency control in Distributed Database.

EMPLOYABILITY

COURSE OUTCOMES:

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations.
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.

Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan “Database System Concepts”, Fifth Edition, McGraw Hill, 2010.
2. C.J. Date, “An Introduction to Database Systems”, Eight Edition, Pearson Education Delhi, 2003.

20212SEC13	Discrete Mathematics	6	0	0	4
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AIM:

To provide in-depth knowledge of Mathematical logics, Boolean Algebra.

OBJECTIVES:

- To understand the concept of Set Theory and Functions.
- To solve the Recurrence Relations using Generating functions.

UNIT I

Sets, Relations & Functions : Property of binary relations, Equivalence, Compatibility, Partial ordering relations, Hasse diagram, Functions, Inverse function, Compositions of functions, Recursive functions.

UNIT II

Mathematical logic : Logic operators, Truth tables, Theory of inference and deduction, Mathematical Calculus, Predicate Calculus, Predicates and Qualifiers.

UNIT III

Groups & Subgroups : Group axioms, Permutation groups, Cosets, Normal subgroups, Semi groups, Free semi groups, Monoids, Sequential Machines, Error Correcting Codes, Modular arithmetic Grammars.

UNIT IV

Lattices & Boolean Algebra: Axiomatic definition of Boolean algebra as algebra as algebraic structures with two operations, Basic results truth values and truth tables, The algebra of propositional functions, Boolean algebra of truth tables.

UNIT V

Combinatorics & Recurrence Relations : Disjunctive and sequential counting, Combinations and permutations, Enumeration without repetition, Recurrence Relation, Fibonacci relation, Solving recurrence relation by Substitution, Solving non recurrence relation by conversion to linear recurrence relation.

EMPLOYABILITY

Outcomes:

- The common 2-year sequence works well for many disciplines.
- Topics can be introduced ""just-in-time"" for many disciplines.
- Since all students take the same sequence, advising is relatively easy
- Ability study of mathematical structures that are countable or otherwise distinct and separable.
- Examples of structures that are discrete are combinations, graphs, and logical statements. Discrete structures can be finite or infinite.

REFERENCES:

1. Trembly J.P & Manohar. P. “Discrete Mathematical Structures with Applications to Computer Science”.
2. Kolman, Busy & Rose “ Discrete Mathematical Structures “PHI
3. K.D Joshi “ Foundations of Discrete Mathematics” , Wiley Eastern Limited.
1. Seymour Lipschutz & March Lipson Tata Mc Graw Hill.
2. C.L.Liu “ Elements of Discrete Mathematics “ Tata Mc Graw Hill.

20220SEC14L	J2EE programming Lab	0	0	3	2
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1. Load an image on to applet. As the user selects portions of this image, rectangular regions corresponding to the selection should be highlighted by enveloping them in rectangles (use mouse events). Also the user can change the colors of selected regions.
2. Create an application, which consists of a dialog box that could be used to obtain an user name and a password to connect to some on line service. The dialog box consists of two fields user name, password and two buttons of Ok & Cancel for accepting user input.
3. Write a java program, which will make balls of various colors to move within the frame windows.
4. Write a JSP Program to manipulate the following information:
 - a. Last Date Visited
 - b. Last Time Visited
 - c. Number of Visited
4. Create Mark List Program using JDBC with UI Concept.
5. Create a SERVLET Program with JDBC.
6. Create a JSP Program to display a message.
7. Create a conversation using RMI concept.

EMPLOYABILITY

Course outcomes:

- The students able to Design and develop GUI applications using Abstract Windowing Toolkit (AWT)
- Swing and Event Handling
- Web applications and Designing
- Enterprise based applications for business logic
- In depth manual testing teaching with case studies.
- Programmer training by creating standardized, reusable modular components and by enabling the tier to handle many aspects of programming automatically.

20220SEC15L	RDBMS Lab	0	0	3	2
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1. Creating, Updating and Inserting into databases and simple queries.
2. Uses of Select statement – for queries using
 - (i) AND,OR,NOT Operations, WHERE clause
 - (ii) UNION, INTERSECTION , MINUS
 - (iii) Sorting and Grouping
3. **Nested queries using SQL**
 - (i) **Sub queries**
 - (ii) **Join**
4. **Built-in functions of SQL**
5. Creation of simple forms
6. Use of indexes, creating views and querying in views
7. Cursors, triggers and stored procedures and functions
8. Case Studies

- i. Student Evaluation systems
- ii. Pay-roll system
- iii. Income tax calculation
- iv. Seat reservation problems
- v. Mark sheet preparation

EMPLOYABILITY

Course Outcomes:

- The students able to Design and develop Normalize a database
- Can Declare and enforce integrity constraints on a database using a state-of-the-art.
- Programming PL/SQL including stored Procedures.
- Sharing of data and data integrity.
- Reducing Data Redundancy.

20220DSC16A	Discipline Specific Elective – I WAP and XML	6	0	0	4
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Aim:

To provide a web – like experience on small portable devices..

Objectives:

- To bring internet content and advanced data services to digital cellular phones and other terminal
- To create a global wireless protocol specification that will work across differing wireless network technologies.
- Xml was designed to carry data with focus on what data is.
- Xml tags are not predefined like HTML tags are.

UNIT-I

Overview of wap: wap&wireless world- wap application architecture – wap internal Structure –Wap versus web-setting up wap: available software products –wap resources –the development tool kit

UNIT-II

Wap gateways: definition –functionality of a wap gateways the web model versus wap model – positioning of a wap gateway in the network-selecting a wap gateway Basic WML: extensible mark-up language- WML structure -a basic WML card-text formatting-navigation –advance display features

UNIT-III

Interacting with the user: making a selection-events-variable-input parameter passing- WML script-need for WML script-lexical structures-variable & literal-operators-automatic Data type conversion-control constructs-functions using the standard libraries-pragmas-dealing with errors.

Unit-IV

Xml-introduction to Xml-an eagle’s eye-view of xml-xml definition –life of an xml document-related technologies-an introduction to xml application-xml application-xml for xml- first xml document structuring data: xmlizing the data-the advantages of the xml format-preparing style sheet for document display.

Unit-V

Attributes, empty tags and xsl: attribute versus element- empty tags- xsl- well formed Xml Document- foreign language and non – roman text- non roman scripts, character set, fonts and glyphs- legacy character set –Unicode character set- procedure to write xml in Unicode.

EMPLOYABILITY

Course Outcomes:

- To Identify advance concepts of WAP browser for mobile devices such as mobile phones that uses the mobile protocol.
- XML/WML is used to design wap pages for mobile devices.
- To develop a animated GIF, Java AWT, Frames, ActiveX Controls, Shockwave, movie clips, audio.
- To Designed for large bandwidth (compared to wireless access) and low delay

TEXT BOOK:

Unit-1, 2,3: Professional WAP with XML, WML scripts – Charles Arehat.

Unit-4, 5: XML TM BIBLE – Elliotte vusty Harold

20220DSC16B	Discipline Specific Elective – I Advanced Computer Architecture	6	0	0	4
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Aim:

To provide depth knowledge about computer design and memory of computer.

OBJECTIVES:

The student should be made to:

Understand the micro-architectural design of processors

Learn about the various techniques used to obtain performance improvement and power savings in current processors

UNIT I FUNDAMENTALS OF COMPUTER DESIGN

Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability - Performance Evaluation

UNIT II INSTRUCTION LEVEL PARALLELISM

ILP concepts – Pipelining overview - Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling - Multi-threading - Limitations of ILP – Case Studies.

UNIT III DATA-LEVEL PARALLELISM

Vector architecture – SIMD extensions – Graphics Processing units – Loop level parallelism.

UNIT IV THREAD LEVEL PARALLELISM

Symmetric and Distributed Shared Memory Architectures – Performance Issues – Synchronization – Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors

UNIT V MEMORY AND I/O

Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

Evaluate performance of different architectures with respect to various parameters

Analyze performance of different ILP techniques

Identify cache and memory related issues in multi-processors

TEXT BOOK:

1. John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”,

Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

REFERENCES:

1. Kai Hwang and Faye Briggs, “Computer Architecture and Parallel Processing”, Mc Graw-Hill International Edition, 2000.

2. Sima D, Fountain T and Kacsuk P, ”Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.

SEMESTER II

20220SEC21	Python Programming	5	0	0	4
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AIM

To enable the student to be familiar with Python Programming.

OBJECTIVES:

On successful completion of the course the student should have understood the concepts in Python and its application.

Unit - I

Core Python: Introduction-features-Comparative study-Comments-Operators-Variables and Assignments-Numbers-String-List and Tuple-Dictionary-Statements and Iterative statements-list comprehensive-Errors and Exception-functions-Classes-Modules-Useful function. Basics: Syntax and Statements-Variable Assignments-Identifier-Style-Memory Management-Application Example. Objects: Introduction-Standard Type- Built-in-type-Internal type-Standard type operator and Built-in functions-Categorizing standard type-Unsupported type.

Unit – II

Numbers: Introduction- Integer-Floating Point-Complex numbers-Operators-Built-in-functions-Other numeric type-Sequence-Strings-Strings and Operator-String only operator-Built-in-Functions-Built-in-Methods-String Features-Unicode-Related Modules.

Unit – III

List-Operators-Built-in-Functions-Built-in-Methods-Features of List-Tuple: Introduction-Operators and Built-in-Functions-Features-Related Modules-Mapping type: Dictionaries-Operators-Built-in and Factory Functions-Built-in-Methods. Set type: Introduction-Operators-Built-in Function-Built-in Methods-Related Modules-Conditional and looping statement.

Unit – IV

File: Objects- Built in Functions-Methods-Attributes-Standard files-Command line Argument-File System-File Execution-Persistent Storage Modules-Related Module. Class: Introduction-Class and Instance- Method calls. Exception and Tools: Why use it?-Exception roles-Short story-Try/finally statement.

Unit – V

Regular Expression: Introduction-Special Symbols and characters-Regexes and Python-Examples of Regexes. Network Programming: Architecture-Socket. Internet Client

Programming- Transferring files-Email.GUI Programming: Introduction-Tkinter and Python.DB Programming: Introduction-Python DB-API-Non-Relational DB. Web Services: Introduction-Microblogging with Twitter.

EMPLOYABILITY

Outcomes:

- Presence of Third Party Modules.
- Extensive Support Libraries.
- Open Source and Community Development
- Able to determine the methods to create and manipulate Python programs.
- Can Identify the commonly used operations involving file systems and regular expressions

REFERENCES:

1. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
2. Wesley J Chun Core python Application Programming,3rd Edition,
3. Lutz, Mark, Learning Python, 5th Edition, O Rielly

20220SEC22	Cryptography & Network Security	5	0	0	4
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AIM:

To introduce about Internet Security in terms of measures to deter, prevent, detect, and correct security violations that involve the transmission of information

OBJECTIVES:

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory
- To understand authentication and Hash function.
- To know the network security tools and system level security used.

UNIT I

CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Model-substitution techniques-transposition technique-Rotor machine-Steganography.BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD: Simplified DES-Block cipher principles-The data encryption standard-the strength of DES-Differential and linear cryptanalysis-Block cipher design principles-Block cipher modes of operation.

UNIT II

PUBLIC KEY CRYPTOGRAPHY AND RSA: Principles of public key cryptosystem-The RSA algorithm.KEY MANAGEMENT OTHER PUBLIC KEY CRYPTOSYSTEMS: key management-Diffie-Hellman Key Exchange-Elliptic curve Arithmetic-Elliptic curve cryptography.

UNIT III

HASH ALGORITHM :MD5 Message Digest Algorithm-Secure Hash Algorithm-RIPEMD-160-HMAC.DIGITAL SIGNATURE AND AUTHENTICATION PROTOCOLS: Digital Signatures-Authentication Protocols-Digital Signature Standard.

UNIT IV

AUTHENTICATION APPLICATION : Kerberos-X.509 Authentication Service-Recommended Reading and Websites.ELECTRONIC MAIL SECURITY: Pretty Good Privacy-S/MIME IP Security : IP Security Overview-IP security Architecture-Authentication Header- Encapsulating Security Payload- Combining Security

Associations -Key Management.WEB SECURITY : Web security considerations – Secure Socket Layer and Transport Layer Security – Secure Electronic Transactions.

UNIT V

INTRUDERS : Intruders – Intrusion detection – Password management. MALICIOUS SOFTWARES : Viruses and Related Threats – Virus countermeasures.

FIREWALLS: Firewalls Design Principles-Trusted Systems.

EMPLOYABILITY

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

REFERENCES:

1. “Cryptography and Network Security “ – William Stallings – 3rd Edition Pearson Education 2003.
2. “Network Security essentials Applications and Standards”, William Stalings , Pearson Education 2007.

20220SEC23	Software Engineering	5	0	0	4
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AIM:

To introduce the methodologies involved in the development and maintenance of Software (i.e) over its entire life cycle.

OBJECTIVES:

- To be aware of Softwares
- Different Life Cycle models.
- Requirements dictation process.
- Verification Validation techniques.
- Project planning and Management.

UNIT I

Introduction - definitions - size factors - quality and productivity factors - managerial issues. Planning a software project - introduction - defining the problem - developing a solution strategy - planning the development process - planning an organizational structure - other planning activities.

UNIT II

Software cost estimation - cost factors - cost estimation techniques staffing level estimation - estimating software maintenance costs. Software requirements definition - software requirement specification - formal specification techniques - languages and processors for requirements.

UNIT III

Software design - fundamental design concepts - modules and modularization criteria - design notations - design techniques - detailed design considerations - real time and Distributed system design - test plans - milestones, walkthrough and inspections - design guidelines.

UNIT IV

Implementations issues - structured coding techniques - coding style - standards and guidelines - documentation guidelines -data abstraction - exception handling - concurrency mechanisms.

UNIT V

Verification and validation techniques - quality assurance - walkthrough and inspections - static analysis - symbolic execution - UNIT testing and debugging - system testing - formal verification. Software maintenance -

enhancing maintainability during development - managerial aspects - configuration management - source code metrics - other maintenance tools and techniques.

EMPLOYABILITY

OUTCOMES:

- Get an insight into the processes of software development
- Able to understand the problem domain for developing SRS and various models of software engineering
- Able to Model software projects into high level design using DFD,UML diagrams
- Able to Measure the product and process performance using various metrics
- Able to Evaluate the system with various testing techniques and strategies

REFERENCES:

1. Software Engineering Concepts - Richard Fairley TMH
2. Roger S.pressman, "Software engineering", 5th edition, 2001, MGH publishers.
3. Marlim L.Shoeman, "Software Ezngineering", 1983,MGH Publishers.

20220SEC24L	Python Programming Lab	0	0	3	2
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1. Find the square root of a number (Newton's method)

2. Exponentiation (power of a number)
3. Find the maximum of a list of numbers
4. **Linear search and Binary search**
5. Selection sort, Insertion sort
6. Merge sort
7. First n prime numbers
8. Multiply matrices
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file

EMPLOYABILITY

Outcome:

- Able to determine the methods to create and manipulate Python programs.
- By utilizing the data structures like lists, dictionaries, tuples and sets.
- Identify the commonly used operations involving file systems and regular expressions
- Duck typing and huge standard library
- Presence of third-party modules.

20220SEC25L	UNIX Lab	0	0	3	2
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1. Write a menu driven shell program for the following :

- a. List of files.
- b. Processes of users.

- c. Today's Date
- d. Users of system.
- e. Quit of Unix

2. Write a shell program which accepts the name of a file from the standard input and tests to find the file access permissions, such as read, write and execute.

3. Write a shell program which accepts the name of a file from the standard input and perform the following

a. Accept five names in a file.

a. Sorts the names in existing file.

b. Lists unsorted and sorted file.

c. Quit

4. Write a menu driven shell program to copy, edit, rename and delete a file.

5. Write a menu driven shell program to perform the following task

a. Write a sentence in file.

b. Search for a given word or pattern in an existing file.

c. Quit.

6. Write a shell program to prepare electricity bill for domestic consumers.

For first 100 units – Rs. 0.75 / Unit

For next 100 units – Rs. 1.50 / Unit

Above 200 units – Rs. 3.00 / Unit

Prepare the bill for the following format.

7. Write a shell program to display the result PASS or FAIL using the information given below student name ,student reg.no., mark1,mark2,mark3,mark4 the minimum pass for each subject is 50.

8. Merge the contents of the file file1,file2 and store in another file.

SKILL DEVELOPMENT

Course Outcome:

- To introduce Basic Unix general purpose Commands
- To learn network Unix commands.
- To learn C programming in Unix editor environment.
- To learn shell script and sed concepts.
- To learn file management and permission advance commands.
- To learn awk, grap, perl scripts.

20220DSC26A	Discipline Specific Elective – II Artificial Intelligence	5	0	0	4
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Aim:

To Acquire Knowledge on various AI Techniques and Expert Systems.

Objective:

- To learn AI Basic Concepts
- To understand Expert Systems Architectural-Components
- To study Expert System development process
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UNIT I

The AI definition - AI Techniques- Problems, Problem Space and search- Defining the problem as a state space search- Problem Characteristics- Heuristic Search Techniques- Generate and Test- hill Climbing- Best First Search- Problem reduction - Constraint Satisfaction- means -ends analysis.

UNIT II

Game Playing- Min-Max Procedure- Adding Alpha-Beta Cutoffs- Additional Refinements- Searching AND/OR Graphs - Using Predicate Logic- Representing Simple Facts and Logic- Representing instance and IS a relationships- Computable functions and predicates- Use of the predicate calculus in AI Resolution- natural deduction.

UNIT III

Representing knowledge using rules- Procedural versus declarative knowledge- Logic Programming- Forward versus Backward Reasoning- Resolving within AND/OR Graphs matching- control knowledge-Symbolic Reasoning under uncertainty- Non-monotonic reasoning- Implementation issues- - Fuzzy Logic.

UNIT IV

Expert Systems- Architectural-Components- Explanation facilities- Knowledge acquisition.

UNIT V

Expert System development process- Non-formal representation of knowledge- Semantic networks- Frames- Scripts- Expert System Tools.

EMPLOYABILITY

OUTCOMES:

At the end of the course, the student should be able to:

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalize a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
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REFERENCE BOOK:

1. For Units I, II, III: Elaine Rich and Kevin Kaight, “**Artificial Intelligence**”, Tata McGraw Hill, 2nd Edition, 1991.
2. For Units IV, V: David W. Rolston, “**Principles of Artificial Intelligence and Expert Systems Development**”, McGraw Hill.

20220DSC26B	Discipline Specific Elective – II Distributed Operating System	5	0	0	4
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Aim:

To understand the concept of distributed computing

Objectives

- It is easy for users to access remote resources and to share them with others in a controlled way.

- Ideally this arrangement is drastically more fault tolerant and more powerful than many combinations of stand-alone computer systems..

UNIT-I:

Introduction to distributed system-what is a distributed system-goals-h/w concepts- s/w concepts – design issues. Communication in distributed systems: layered protocols –asynchronous transfer mode network.

UNIT-II:

The client/server model-remote procedure call- group communication. Synchronization in distributed systems: clock synchronous-mutual exclusion-election algorithm-atomic transaction-deadlock in distributed system.

UNIT-III:

Process & processors in distributed system: Threads system-models-processor allocation- scheduling in distributed system-fault tolerance-real time distributed system.File system: distributed file system design-distributed file system implementation-trends in distributed file system.

UNIT-IV:

Distributed shared memory: Introduction to distributed shared memory- consistency models-page based distributed shared memory-shared variable distributed shared memory-object based distributed shared memory-comparison.

UNIT-V:

Naming facility in distributed operating system-security in distributed operating system.

Case studies: Amoeba-V-system-Mach-Chorus-DCE-comparison.

EMPLOYABILITY

Outcome:

- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To Understand the concepts and implementation Memory management policies and virtual memory.

REFERENCE BOOK:

“**Distributed Operating System**” – Andrew S.Tanenbaum.

“**Distributed Operating Systems**” – Pradeep K.Sinha.

20220RMC27	Research Methodology	4	0	0	2
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AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication

- To train in MATLAB platform for basic computational programming and analysis.

OUTCOME:

Ability to develop research questions and the various research strategies and compile research results in terms of journal manual scripts.

PREREQUISITES:

Research methodology course in UG level or equivalent knowledge.

UNIT-I Introduction to research methodology

Objectives of research – type of research – Significance of research. Research methodology – Research and scientific method – Criteria of good research – Problems encountered by research in India.

UNIT-II Data base and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT-III Data Analysis:

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – normal distribution curve – Statistical treatment of finite samples – T test and F test (ANOVA) co – Variance (ANCOVA) correlation and multiple regression.

UNIT-IV Thesis and paper writing:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – Reference and Appendices.

UNIT-V Application on MATLAB:

Numerical Integration – Numerical integration, ordinary differential equations, partial differential equations, and boundary value problems - Fourier analysis – Fourier transforms, convolution.

EMPLOYABILITY

Outcome:

These students able to demonstrate knowledge of research processes (reading, evaluating, and developing)

Can identify, explain, compare, and prepare the key elements of a research proposal/report.

To compare and contrast quantitative and qualitative research paradigms

Ability to develop research questions and the various research strategies

Compile research results in terms of journal manual scripts

References:

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

SEMESTER III

20220SEC31	Open Source programming	6	0	0	6
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AIM:

To improve the Programming Knowledge of VBScript, JavaScript, Perl & PHP.

OBJECTIVES:

- To have the knowledge of VBScript, JavaScript.
- To explore the use of Perl & PHP.

UNIT I:

VBScript –VBScript Programming Basics – Working with Operators – Controlling Program flow with VBScript- Working with Functions, Subroutines and Dialog boxes – Data type Conversion Features – Putting it all together with VBScript – using the Script Debugger.

UNIT II:

The Basic of JavaScript: Overview of JavaScript – Object Orientation and JavaScript – General Syntactic Characteristics – Primitives, Operation and Expressions – Screen Output and Keyboard Input – Control Statements – Object Creation and Modification – Arrays – Functions – Constructors – Pattern Matching Using Regular Expressions. JavaScript and Html Documents: The JavaScript Execution Environment – The Document Object Model – Element Access in JavaScript – Events and Event Handling – Handling Events from Body Elements, Button Elements, Text Box and Password Elements – The DOM 2 Event Model – The navigator Object.

UNIT III:

The Basics of Perl: Origins and Uses of Perl – Scalars and their Operations – Assignment Statements and Simple Input and Output – Control Statements – Fundamentals of Arrays – Hashes – References – Functions – Pattern Matching – File Input and Output. Using Perl for CGI Programming: The Common Gateway Interface – CGI Linkage – Query String Format – The CGI .pm Module – Cookies.

UNIT IV:

Introduction to PHP: Origins and Uses of PHP – Overview of PHP – General syntactic characteristics – Primitives, Operation and Expressions – Output – Control Statements – Arrays – Functions – Pattern Matching – Form Handling – Files – Cookies – Session Tracking.

UNIT V:

Database Access through the Web: Relational Databases – An Introduction to the Structured Query Language – Architecture for Database Access – The MySQL Database System – Database Access with Perl and MySQL – Database Access with PHP and MySQL – Database Access with JDBC and MySQL .

EMPLOYABILITY

OUTCOMES:

- Understand process of executing a PHP-based script on a webserver.
- Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
- Understand basic PHP syntax for variable use, and standard language constructs, such as conditionals and loops.
- Understand the paradigm for dealing with form-based data, both from the syntax of HTML forms, and how they are accessed inside a PHP-based script.

REFERENCES:

1. UNIT I: Scot Johnson “Using Active Server Page”.
2. UNIT II, III, IV, V: Robert W.Sebesta, “Programming the World Wide Web” Third edition.
3. Internet & WWW How to program by Deital , Third edition.

20220SEC32	.Net Programming	6	0	0	5
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AIM

To cover the fundamental concepts of the .NET framework.

OBJECTIVES

- To gain knowledge in the concepts of the .NET framework and its technologies.
- To get experience in building sample applications of large-scale projects.

UNIT I

Visual basic.NET and the .NET Framework –The elements of Visual Basic .NET

UNIT II

Visual Basic .NET operators-software Design, conditional structures, and controls Flow-Methods.

UNIT III

Interfacing with the End user-Asp.NET Applications.

UNIT IV

Web Form Fundamentals – Web Controls – Validation and Rich Controls.

UNIT V

ADO.NET Data Access – Data Binding –Data List, DataGrid, and Repeater.

SKILL DEVELOPMENT

OUTCOMES:

- Create web-based distributed applications using ASP.NET, SQL Server and ADO.NET
- Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio.
- Utilize the .NET environment to create Web Service-based applications and components.

REFERENCES:

1. The Complete Reference VB.NET – Jeffrey R-Shapiro- Tata McGrawHill Edition
2. The Complete Reference ASP.NET- Matthew MacDonald- Tata McGrawHill Edition
3. Visual Basic .Net Programming -Bible.
4. Visual Basic.Net Black Book- Steven Holzner.

20220SEC33L	Open Source programming Lab	0	0	3	2
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1. Prepare a web page in ASP which displays course submission form using objects.
2. Write a program for addition using VBScript.
3. Write a program for finding maximum number using JavaScript.
4. Develop a web page which display window shrinking using JavaScript
5. Write a program in JavaScript a)OnMouse move b)OnMouse out.
6. Write a Perl script using array find element in list.
7. Write a Perl script for simple manipulation.
8. Develop a PHP program and check message passing mechanism between pages.
9. Develop a PHP program to display student information using MYSQL table.
10. Develop a college application form using MYSQL table.

SKILL DEVELOPMENT

Outcome:

- These students able to develop efficient open source programmes for rapidly developing network world
- Reliability and auditability.
- Integrated management.
- Simple license management

20220SEC34L	.Net Programming Lab	0	0	3	2
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1. Write a program in VB. Net to check whether given number is Odd or Even.
2. Write a program to find maximum from given numbers.
3. Write a program to find are of a circle
4. Design ASP.Net web form using Html Server Controls to enter job seeker's details.
5. Create an ASP.Net web form using Web control to enter E-Mail registration form.
6. Apply appropriate validation techniques in E-Mail registration form using
7. Validation controls.
8. Write an ASP.Net application to retrieve form data and display it the client browser in a table format.
9. Create a web application using ADO.Net that uses which performs basic data

Manipulations:

(i). Insertion (ii) Updating (iii) Deletion (iv) Selection

Hint: Do operations using Ms-Access and SQL-Server

10. Create an application using Data grid control to access information's from table in SQL server.

EMPLOYABILITY

Outcome:

- The students are able to develop programs using C# based on object oriented concepts
- Write the ROBUST, EXTENSIBLE and EFFICIENT programs by using c# code and ASP.Net
- Create dynamic web pages for further development.
- It provides re-usability.
- Less Coding and Increased Reuse of Code:

20220DSC35A	Discipline Specific Elective – III Real time Operating Systems	5	0	0	4
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Aim:

A real time operating system is intended to serve real time applications that process data as it comes in, typically without buffer delays.

objectives:

- To understand the basics of operating systems tasks and basic OS architectures and
- develop these to RTOS
- To understand concepts of task scheduling
- To understand problems and issues related with multitasking
- To learn strategies to interface memory and I/O with RTOS kernels
- To impart skills necessary to develop software for embedded computer systems using
- a real-time operating system.

Unit I

Operating system objectives and functions, Virtual Computers, Interaction of O. S. & hardware architecture, Evolution of operating systems. Architecture of OS (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures). Batch, Multi programming, Multitasking, Multiuser, distributed & real –time O.S.

Unit II

Uniprocessor Scheduling: Types of scheduling: Scheduling algorithms: FCFS, SJF, Priority, Round Robin NIX Multi-level feedback queue scheduling, Thread scheduling, Multiprocessor Scheduling concept concurrency: Principles of Concurrency, Mutual Exclusion. H/W Support, software approaches, Semaphores and Mutex, Message Passing techniques.

Unit III

Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies. memory Management requirements, Memory partitioning: Fixed, dynamic, partitioning.

Unit IV

Memory allocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit), Fragmentation, Swapping, Segmentation, Paging, Virtual Memory, Demand paging.

Unit V

Page Replacement Policies (FIFO, Thrashing, Working Set Model, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches .

Text Books:

1. C.M. Krishna and G. Shin, Real Time Systems, McGraw-Hill International Edition, 1997.
2. Jean J Labrosse, Embedded Systems Building Blocks Complete and Ready-to-use Modules in C, CMP books, 2/e, 1999.

EMPLOYABILITY

Outcome:

- Ability to estimate if a system takes distributed system characteristic into account in a reasonable way.
- Knowing the basic structures (e.g. client-server) and knowing the existing middleware frameworks.
- Ability to estimate framework suitability for different applications.
- Ability to implement a simple distributed software laboratory work with socket and RMI interfaces.
- Understanding the mathematical principles behind validity of algorithms solving the problems of distribution.
- Understanding the problems that will arise if atomicity and timing issues are not handled in a distributed application.

References:

1. Jean J Labrosse , Micro C/OS-II, The Real Time Kernel, CMP Books, 2011
2. Sam Siewert, V, Real-Time Embedded Components and Systems: With Linux and RTOS (Engineering), 2015
3. Tanenbaum, Modern Operating Systems, 3/e, Pearson Edition, 2007.
4. VxWorks: Programmer's Guide 5.4, Windriver, 1999
5. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, 2/e, Kindle Publishers, 2005

20220DSC35B	Discipline Specific Elective – III Wireless Communication Network	5	0	0	4
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AIM

To promote the international exchange of information related to Wireless Communication systems.

OBJECTIVES:

- To understand the concepts of Transmission fundamentals.
- To study the functions of TCP/IP suite.
- To describe communication protocols , data transmission modes and satellite communication.

UNIT I

Introduction – Transmission fundamentals.

UNIT II

Communication Networks – Protocols and TCP/IP suite.

UNIT III

Wireless communication Technology – Antennas and propagation – signal encoding technique – spread spectrum – coding & Error control.

UNIT IV

Wireless networking: satellite communication – cellular wireless networks – cordless systems and wireless local loop – mobile IP and wireless Access protocol.

UNIT V

Wireless LANs: Wireless LAN Technology – WiFi and IEEE802.11 –wireless LAN standard – Bluetooth and IEEE 802.15.

EMPLOYABILITY

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Understand the concepts of Transmission fundamentals.
- Study the functions of TCP/IP suite.
- Describe communication protocols , data transmission modes and satellite communication

REFERENCES:

1. William Stallings “wireless communication & Networks”, Second Edition.
2. Blake “wireless communication Technology”
3. Kaveh pahlavan, Prashant Krishnamurthy “Principles of Wireless network”.

SEMESTER IV

20220SEC41	Software Testing	6	0	0	6
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AIM:

To introduce the methodologies involved in the development and maintenance of Software

OBJECTIVES

To be aware of

- Different Life Cycle models software development
- Various Testing methods in software development process

UNIT I

Principles of testing – Software Development lifecycle models.

UNIT II

Testing: White box testing – Black box testing – Integration testing – System acceptance.

UNIT III

Performance – Regression – Internationalization – Adhoc.

UNIT IV

Test planning – Test management – Test process – Test reporting.

UNIT V

Test Metrics and Measurements.

SKILL DEVELOPMENT

OUTCOMES:

- Test the software by applying testing techniques to deliver a product free from bugs
- Evaluate the web applications using bug tracking tools.
- Investigate the scenario and the able to select the proper testing technique
- Explore the test automation concepts and tools
- Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma
- Evaluate the estimation of cost, schedule based on standard metrics

REFERENCES:

1. “Software Testing principles and practices “ by srinivasan Desikan gopalswamy Ramesh.
- 2.” Effective methods for software testing” by William E.perry, Third Edition.

20220SEC42	Human Computer Interaction	6	0	0	5
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AIM:

To have a thorough knowledge about Human Computer Interaction.

OBJECTIVES

- To understand the concept of HCI Ergonomics and WIMP interface.
- To learn about Heuristic process and Evaluation techniques.

UNIT I

The interaction: Introduction - Models of interaction - Frameworks and HCI - Ergonomics - Interaction Styles - Elements of WIMP interface - Interactivity - The Context of the interaction - Paradigm: Introduction - Paradigms for interaction.

UNIT II

Interaction Design basics: Introduction - what is design? - User focus - Scenarios - Navigation design - Screen design and layout - Interaction and prototyping - HCI in the software process: Introduction - The software lifecycle - Usability engineering – interactive design and prototyping – Design rationale.

UNIT III

Design rules: Introduction - Principles to support usability - Standards – Guidelines-Golden rules and heuristics - HCI patterns - Implementation Support: Introduction -elements of windowing systems - Programming the application - Using toolkits- User interface management systems.

UNIT IV

Evaluation techniques: What is evaluation - Goals of evaluation - Evaluation through expert analysis - Evaluation through user participation - Choosing an evaluation method - Universal Design: Introduction - Universal design principles - Multi-modal interaction - Designing for diversity.

UNIT V

User Support: Instruction - Requirements of user support - Approaches to user support - Adaptive help system - Designing user support systems.

SKILL DEVELOPMENT

OUTCOMES:

Upon completion of the course, the student should be able to:

- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites.

REFERENCES:

1. "Human-computer Interaction" - Alan Dix - Pearson Education - 2004.

20220DSC43A	Discipline Specific Elective – IV Multimedia and its application	4	0	0	4
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AIM:

To enable the students to learn the multimedia Systems and its applications.

OBJECTIVES:

- To making multimedia presentation.
- To learn the Multimedia animation.
- To study about multimedia and Internet concepts

UNIT-I:

Introduction – Definition- Multimedia Hardware- Multimedia Software- MULTIMEDIA networking- Multimedia Applications- Multimedia Environments- Multimedia Computer Components- Multimedia Standards- Multimedia PC.

UNIT-II:

Multimedia Information Systems: Limitations in workstation operating systems. Middleware System Services Architecture: Goals of Multimedia System Services- Multimedia System Services Architecture Text: Elements of Text- Using Text in Multimedia Applications- Graphics: Element of Graphics- Images and Color- Graphics file and Application Formats- Obtaining Images for Multimedia use- Using Graphics on Multimedia Applications.

UNIT-III:

Digital Audio Representation and Processing: Uses of Audio in Computer Applications- Digital Representations of sound- Transmission of Digital Sound- Digital Audio Signal Processing, Video Technology: Raster Scanning Principles- Sensors for TV Cameras- Color fundamentals- Color Video- Digital Video and Image Compression: Evaluating Compression System- Video Compression Techniques- JPEG Image Compression Standard- MPEG motion Video Compression Standard.

UNIT-IV:

Multimedia Communications Systems: Applications Network Services- Network Protocols. Multimedia Conferencing: Teleconferencing systems- Requirements for Multimedia Communications- Multimedia Conferencing Architectures.

UNIT-V:

Multimedia and Internet: Internet- Client/Server Technology- Communications protocol- Internet Addressing- Internet Functions- HTML and Web Authoring. Multimedia development Team: Team Approach- Assembling multimedia Production Team- Multimedia Development Process: Multimedia Project- Structured Multimedia development- casting multimedia project.

EMPLOYABILITY

OUTCOMES:

- Enhance the perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information.
- Able to understand different realizations of multimedia tools
- Able to develop interactive animations using multimedia tools
- Gain the knowledge of different media streams in multimedia transmission

REFERENCE BOOK:

1. **For Unit I:** Tay Vaughan, “**Multimedia making it work**”, 4th Edition Tata McGraw – Hill Edition, 2000.
2. **For Units II,III,IV:** John F.Koegel Buferd, “Multimedia Systems”, Published by Addison Wesley Longman, 3rd Edition year 2000.
3. **For Unit V:** David Hillman, “Multimedia Technology and Applications”, Galgotia Publications Pvt. Ltd., year 1998.
4. Fred T. Hofstetter, “Multimedia Literacy”, McGraw Hill, 1995.

20220DSC43B	Discipline Specific Elective – IV Middleware Technology	4	0	0	4
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Aim:

To foster interaction between different aspects of an application or even between applications themselves.

Objectives

- To provide a simple environment to manage complex, heterogeneous and distributed infrastructures.
- It can be defined as a layer that is placed above an operating system or networking software and below the application tier.

UNIT I INTRODUCTION

Emergence of Middleware – Objects, Web Services – Middleware Elements – Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction-Oriented Middleware – MOM – RPC.

UNIT II OBJECT ORIENTED MIDDLEWARE

OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI –COM+.

UNIT III COMPONENT OBJECT RESOURCE BROKER ARCHITECTURE (CORBA)

Naming – Trading – Life Cycle – Persistence – Security – CORBA.

UNIT IV WEB SERVICES

Introduction – XML Web Services standards – Creating Web Services – Extending Web

Services – Messaging Protocol – Describing – Discovering – Securing.

UNIT V OTHER TYPES OF MIDDLEWARE

Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware.

SKILL DEVELOPMENT

Outcome:

- In Business it helps streamline processes and improve efficiency in terms of organization.
- It facilitates communication between the system.
- It is able to maintain the integrity of information across the multitude of systems with in a network.
- Understand middleware interoperability.
- Can able to develop middleware component.

REFERENCES BOOKS

1. Chris Britton and Peter Eye, "IT Architecture and Middleware", Pearson Education, 2nd Edition, 2004.
2. Wolfgang Emmerich, "Engineering Distributed Objects", John Wiley, 2000.
3. Keith Ballinger, ".NET Web Services – Architecture and Implementation", Pearson Education, 2003. (Unit IV).
4. Qusay H. Mahmoud, "Middleware for Communications", John Wiley and Sons, 2004.
5. Gerald Brose, Andreas Vogel, Keith Duddy, "Java™ Programming with CORBA™: Advanced Techniques for Building Distributed Applications", Wiley, 3rd edition, January, 2004.
6. Michah Lerner, "Middleware Networks: Concept, Design and Deployment of Internet Infrastructure", Kluwer Academic Publishers, 2000.

202MAOEC	Open Elective Applicable Mathematical Techniques	4	0	0	3
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Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

SKILL DEVELOPMENT

References

Unit I, “Numerical Methods in Science and Engineering” M.K.Venkatraman

Units II to V, “Operations Research”, Kantiswarup, P.K. Gupta and Manmohan

202BCOEC	Open Elective Herbal Medicine chniques	4	0	0	3
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Aim:

- Be able to advise and educate effectively to create a comprehensive wellness plan incorporating herbal, dietary and lifestyle recommendations integrating self-awareness and lessons of nature

Objective

- Possess knowledge of traditional herbal systems as well as an understanding of the principles and practices of modern Western herbalism
- Demonstrate the ability to critically analyze herbal research and contribute to the current body of herbal literature
- Know how to integrate knowledge of raw materials, formulation, and herbal pharmacy for product development purposes
- Know how to effectively educate individuals and groups about herbs
 - Be able to demonstrate basic skills in herb identification, harvesting, and preparation
 - Be able to address potential safety concerns including herb-drug interactions

Outcomes

- Accurately gather information regarding past and current health status while differentiating between phenomena and the client’s interpretation of phenomena
- Synthesize the above information to create a comprehensive assessment of health inputs and processes

- Work with clients to develop individualized goals and a plan for health and wellness

Unit I

Tribal medicine – methods of disease diagnosis and treatment – Plants in folk religion – *Aegle marmelos*, *Ficus benghalensis*, *Curcuma domestica*, *Cyanodon dactylon* and *Sesamum indicum*.

Unit II

Traditional knowledge and utility of some medicinal plants in Tamilnadu – *Solanum trilobatum*, *Cardiospermum halicacabum*, *Vitex negundo*, *Adathoda vasica*, *Azadirachta indica*, *Gloriosa superba*, *Eclipta alba*, *Aristolochia indica* and *Phyllanthus fraternus*.

Unit III

Plants in day today life – *Ocimum sanctum*, *Centella asiatica*, *Cassia auriculata*, *Aloe vera*. Nutritive and medicinal value of some fruits (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate) and vegetables - Greens (Moringa, *Solanum nigrum* Cabbage).

Unit IV

Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

Unit V

Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

SKILL DEVELOPMENT

References

1. Tribal medicine – D.C. Pal & S.K. Jain Naya Prakash, 206, Bidhan Sarani, Calcutta , 1998
2. Contribution to Indian ethnobotany – S.K. Jain, 3rd edition, Scientific publishers, B.No. 91, Jodhpur, India. 2001
3. A Manual of Ethnobotany – S.K.Jain, 2nd edition, 1995.
4. Kumar, N.C., An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi. 1993.

5. Rao, A.P. Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi, 1999

202CHOEC	Open Elective Green Chemistry	4	0	0	3
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Objectives: To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollutionPollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentationAntibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

EMPLOYABILITY

Outcomes:

- To understand the environmental status and evolution.
To know about the Pollution and its prevention measures.
To familiarize the green chemistry.
To learn about the bio-catalytic reactions.
To understand about the vitamins and antibiotics.
To expertise the global warming and its effects.
To learn about the control and remedial measures of green house effect.
To know about the various analytical green methods

20220PRW44	Project work	0	0	0	10
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Each student will develop and implement individually developed application software based on any of the latest technologies.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student’s knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Sc.,(CS) curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	2
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	2
IV	Project Work	10

Blueprint for assessment of student's performance in Research Led Seminar Course

<input type="checkbox"/>	Internal Assessment:	40 Marks
<input type="checkbox"/>	Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks	
<input type="checkbox"/>	Seminar Review Presentation : 10 Marks	
<input type="checkbox"/>	Literature Survey : 10 Marks	
<input type="checkbox"/>	Semester Examination :	60 Marks
	(Essay type Questions set by the concerned resource persons)	

Blueprint for assessment of student's performance in Socio Technical Project

<input type="checkbox"/>	Continuous Internal Assessment through Reviews:	40 Marks
<input type="checkbox"/>	Review I : 10 Marks	
<input type="checkbox"/>	Review II : 10 Marks	
<input type="checkbox"/>	Review III : 20 Marks	
<input type="checkbox"/>	Evaluation of Socio Technical Practicum Final Report:	40 Marks
<input type="checkbox"/>	Viva- Voce Examination:	20 Marks
<input type="checkbox"/>	Total:	100 Marks

Blueprint for assessment of student's performance in Research Methodology Courses

	Continuous Internal Assessment:	20 Marks
<input type="checkbox"/>	Research Tools(Lab) :	10 Marks
<input type="checkbox"/>	Tutorial:	10 Marks
	Model Paper Writing:	40 Marks
●	Abstract:	5 Marks
●	Introduction:	10 Marks
●	Discussion:	10 Marks
●	Review of Literature:	5 Marks
●	Presentation:	10 Marks
	Semester Examination:	40 Marks
	Total:	100 Marks



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M.Phil. (Computer science)
PROGRAMME
CURRICULUM & SYLLABUS – 2020

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF COMPUTERSCIENCE

M.Phil., COMPUTER SCIENCE- REGULATION 2020
COURSE STRUCTURE

Semester I

Course Code	Course Title	L	T	P	C
203CSC11	Research Methodology	6	0	0	4
203CSC12	Advanced Technologies in Computer Science	6	0	0	5
203CSC13_	A. Advanced Networking B. Big Data	6	0	0	5
CPE_RPE	Research and Publication Ethic	-	-	-	2
	Total	18	0	0	16

L - Lecture, T – Tutorial, P – Practical, C – Credit

Semester II

Course Code	Course Title	L	T	P	C
203CSD21	Dissertation - (Topic selected should be relevant to the topic of the In-depth paper	-	-	-	10
	Total	0	0	0	10

Programme Specific Outcomes (PSOs)

PSO	Upon completion of M.Phil degree programme, the graduates will be able to:	PO Addressed
PSO – 1	Pursue Ph.D programme with norms of scholarly research that chip into the augmentation of students personal and professional development	PO - 1
PSO – 2	Acquire in-depth knowledge of the process of developing new models, programming scripts as well as gain expertise of well-defined area of research in computer science	PO - 2
PSO – 3	Develop innovative methodologies to tackle issues identified and contributing to the development of technological knowledge and intellectual property	PO - 3
PSO – 4	Evolve as excellent professionals in the public sector units CSRD/DRDO/CSIR laboratories and contribute towards the scientific growth of the country	PO - 5
PSO – 5	Modern Internet of things and tools usage: Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modeling to complex scientific activities with an understanding of the limitations.	PO - 2
PSO – 6	NOSQL database: Apply the complex skill towards database and analysis NOSQL	PO - 7
PSO – 7	PO7. Project management: Demonstrate knowledge understanding of the deployment, administrative and query principles and apply these to one's own work, as a member and leader in a team, to manage projects and in Multi skills and language of software and theoretical view.	PO - 8
PSO - 8	Develop and enhance leadership and teaching skills	PO - 4

Semester I**Course outcomes (COs)****Research methodology****Subject code: 203CSC11**

CO	Upon completion of this course, students will be able to	PSOs
CO-1	Understand the basic concepts of research and its	PSO - 1
CO-2	Solve partial differential equations and special function of problem solving (greedy function, Fourier functions, Gaussian functions, associate law, relational database management system of relational of functional dependency, concurrency ACID translation function).	PSO - 3
CO-3	Demonstrate an understanding of the basic features and concepts programming and problem solving of real time problems (expanding Universe using concepts of the teaching ability, learning skills)	PSO - 4
CO-4	Examine the fundamental principles, theories and applications of recent technologies.	PSO - 3

Semester I

Course outcomes (COs)

Advanced Technologies in Computer Science

Subject Code: 203CSC12

CO	Course outcomes	PSOs
CO-1	Interpret the band structure of POP, M2M, RFID, WSN, SCADA and Map Reduce algorithm.	PSO - 2
CO-2	Analyze the structure, preparation of new model of networking in various cluster, cloud and grid in real time environment.	PSO - 3
CO-3	Describe the various crystal growth techniques and determine the growth parameters of various technologies	PSO - 5
CO-4	Categorize different types of programming language, scripts and	PSO - 3

Advanced Networking

Subject Code: 203CSC13

CO	Course outcomes	PSOs
CO-1	Interpret the band structure of MapReduce, Flow Control, Error Control, Congestion Control, Intra and Inter Domain Routing,	PSO - 2
CO-2	Analyze the structure, M2M, RFID, WSN, SCADA, Algorithms using map reduce	PSO - 3
CO-3	Describe Relationships between the relational, Graph databases Schemaless databases. Distribution data models - Single server, Shading in various networking, service providers.	PSO -4
CO-4	Categorize different types of networking and their	PSO - 3

PROGRAMME OUTCOMES (PO):

POs describe what students are expected to know or be able to do by the time of graduation. The Program Outcomes of M.Phil. in Computer Science as follows:

At the end of the programme, the students will be able to:

- 1) Apply the concepts of graph connectivity at appropriate points of graph theory and identify the surfaces which the given graph can be embedded.
- 2) Use Network Flow theory to solve many real time problem such as, Hall's Marriage problem, Konig's problem, deduction of Menger's theorem, finding maximum matching in bipartite graphs.
- 3) Use Polya's theory to count certain configurations in the combinatorial aspects.

- 1) Apply domination theory in installing common facility in appropriate points in Town planning. Further labelling theory is used to allot radio frequency for transmission of messages.
- 2) Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

PEO 1: Technical Proficiency:

Victorious in getting employment in different areas, such as industries, laboratories, Banks, Insurance Companies, Educational/Research institutions, Administrative positions, since the impact of the subject concerned is very wide.

PEO 2: Professional Growth:

Keep on discovering new avenues in the chosen field and exploring areas that remain conducive for research and development.

PEO 3: Supervision Skills:

Encourage personality development skills like time management, crisis management, stress interviews and working as a team.

PEO 4: Administration Skills:

Encourage the administration of computer system to develop a model, log file, clustering skills of partitions of operating management, deadlock management, scheduling processes and handling fault tolerance.

PROGRAM SPECIFIC OUTCOMES (PSO):

PSO 1: To develop research level thinking in the field of pure and applied mathematics for problem solving.

PSO 2: To assimilate complex real time problems ideas and arguments.

PSO 3: To improve your own learning and performance.

PSO 4: To develop abstract rethinking of technologies.

CURRICULUM MAPPING

Course Code	Course Title
PO₁	Core -I Research Methodology
PO₂	Core -II Advanced Technologies in Computer Science
PO₃	Core -III Advanced Networking
PO₄	Core -IV Thesis

M Phil- SYLLABUS

(For the candidates admitted from the academic year 2020-2021 onwards)

PAPER – I RESEARCH METHODOLOGY

(Common for all Subjects except Languages)

Course Code	Course Title	L	T	P	C
203CSC11	Research Methodology	6	0	0	4

Unit – I:

Methods and Technique. An introduction – Defining the research problem – What is a research problem?, Selecting the problem, Necessity of defining the problem, Technique involved in defining the problem, An illustration and conclusion. Research design – Meaning of research design, Need for research design, Features of good design, Important concepts of relating to research design, different research designs, Basic principles of experimental design and conclusion.

Unit – II:

Assignment and Thesis at the tertiary level: Writing at the tertiary level – assignments and term papers, thesis and dissertations, conventions of writing-the question of style. Planning the assignment – A time schedule, consulting source materials, preparing a work bibliography, taking notes, the outlines and the first draft. Planning the thesis – selecting a topic, reviewing the literature, designing the study and the chapter outline. Scholarly writing – a case study

Unit – III:

Writing the thesis or assignment: General format – preliminaries, the text, the reference material, the abstract and final product Page and Chapter format – chapter divisions and sub-divisions, spacing, pagination, margins, paragraph indentation and sample pages Tables and Figures – use of tables and figures, placement of tables and figures, Numbering of tables, numbering of pages, numbering of figures, table and figure captions, format of tables, format of figures, preparation of figures, foot notes to tables and figures, very large table and figures, pagination and margin, spacing and alignment, abbreviations and special symbols and numbers. Referencing –

Reference systems, Essential informations, spacing capitalization and underline, alphabetical and chronological order, edited works and sum special cases.

Unit – IV:

Computer packages and Internet: Word Basics – Creating and working with documents – working with text and tables – Using Mail Merge. Using Excel: Working with worksheets – creating chart – working with Formula and Functions. Using Power Point: Working with power point – User Interfaces – Using templates and wizard (slide Presentation) - - Creating chart and Tables. Internet and World Wide Web (WWW) – Electronic Mail (E-mail) – Intranet and Extranet.

Unit – V:

Descriptive statistics – tabulation, graphical representation – bar diagram – and pie diagrams – various measures of variance, measures of central tendency and normal distribution. Differential statistics “t” test, Chi – square test, “F” test (ANOVA) co -variance (ANCOVA) correlation and multiple regression analysis - Introduction to SPSS.

EMPLOYABILITY

Course Outcomes:

CO-1 Understand the basic concepts of research and its methodologies of scholarly writing and evaluate its quality.

CO-2 Solve partial differential equations and special function of problem solving (greedy function, Fourier functions, Gaussian functions, associate law, relational database management system of relational of functional dependency, concurrency ACID translation function).

CO-3 Demonstrate an understanding of the basic features and concepts programming and problem solving of real time problems (expanding Universe using concepts of the teaching ability, learning skills)

CO-4 Examine the fundamental principles, theories and applications of recent technologies.

References:

- Thesis and Assignment writing by Janarthan Anderson and others – Wiley – Eastern Ltd, 1970. Part I Sections 1,2,3,4. Part II Sections 5,6,9,10.
- Research Methodology by C.R. Kothari, Chapter 1,2,3.

- Microsoft Office 2003 – Edward C. Willet. First Edition 2004, Wiley Publications, USA , (Chapters 2,3,4,5,6,12,14,15,26,28,29)

193CSC12 - ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE				
	6	0	0	5
Pre-requisite: NIL Course Type:	Course Category: Core Theory			

UNIT – I : TCP/IP

TCP/IP Protocol suite – Addressing – Classful addressing – Addressing issues – Subnetting and Supernetting – Variable length blocks – Packet delivery – Forwarding – Routing – ARP and RARP – Internet Protocol – ICMP – IGMP – UDP – TCP – Flow Control – Error Control – Congestion Control – Intra and Inter Domain Routing – Distance Vector Routing – Link State Routing- Path Vector Routing – Multicast Routing – BOOTP – DHCP – DNS – Remote Login and Telnet – FTP and TFTP – Electronic Mail – Network Management – IPV6.

UNIT – II : ADAPTIVE WEB TECHNOLOGY

J2ee: Overview-Multi-tier Architecture-the Enterprise Application-Clients-Sessions Management Web Tier-EJB Tier-J2ee Web Services, Technologies, Components .NET Framework –Architecture-Design Principles- Alternative Implementations Networking-Remoting-Security, **Building Web Applications-Webservices-Characteristics-Architecture-ComponentsSecurity,Standards. Overview of xml.**

UNIT - III : BIG DATA ANALYTICS

Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL- Big Data and its importance, Four Vs, rivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix vector Multiplication by Map Reduce- Big data Business Analytics - State of the practice in Analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders. The Evolution of Big Data-Big Data: The Modern Era- Bringing It All Together-The Path to Big Data-The Realities of Thinking Big DataHands-on Big Data-The Big Data Pipeline in Depth-Big Data Visualization-Big Data Privacy.

UNIT IV : INTERNET OF THINGS

Introduction to IoT – Physical and Logical Design of IoT – Enabling Technologies of IoT – IoT Devices – Pillars of IoT: M2M, RFID, WSN, SCADA – Connection and Management of IoT Devices – IoT Applications: Intelligent Transport – Smart Grid – Smart Buildings.

UNIT V : NoSQL DATABASES

Introduction to NoSQL, Aggregate Data Models - Aggregates - Key - Value and Document. Data models – Column Family stores - Relationships - Graph databases – Schemaless databases - Materialized views. Distribution data models - Single server - Sharding - Master – slave replication – Peer-to peer replication. Consistency - Update consistency - Read consistency - Relaxing consistency - CAP theorem - Version stamps - Business and system Transactions - Version stamps on multiple nodes. MapReduce - Basic MapReduce - Partitioning and combining - Composing MapReduce calculations. Implementation - Key value databases – Document databases - Column Family stores - Graph databases.

EMPLOYABILITY

Outcome:

Interpret the band structure of POP, M2M, RFID, WSN, SCADA and Map Reduce algorithm.

Analyze the structure, preparation of new model of networking in various cluster, cloud and grid in real time environment.

Describe the various crystal growth techniques and determine the growth parameters of various technologies

Categorize different types of programming language, scripts and their characteristics.

Reference Book:

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, 3rd Edition, Tata McGraw –Hill, 2008
2. James McGovern et al., "J2EE1 .4 Bible", Wiley Publishing Inc,2003.
4. Visual studio .Net Walkthroughs- Microsoft Manual.
5. www.msdn.microsoft.com/netframework.
6. Nina Zumel, John Mount “Practical Data Science with R”, Manning Publications, 2014.
7. Dr. Radha Shankarmani, “Big Data Analytics”, 2nd Edition, Wiley Publication, 2018

Wiley India Pvt. Ltd. ISBN: 9788126565757.

8. ArshdeepBahga, Vijay Madiseti, “Internet of Things - A Hands-on Approach”,
Universities Press, 2015.

9. Pramod J. Sadalage, Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging
World of Polyglot Persistence, 1st Edition, Pearson Education, 2012

203CSC13A - Advanced Networking				
	6	0	0	5
Pre-requisite: NIL		Course Category: Core		
Course Type:		Theory		

Unit I : Telecommunication systems:

GSM services – subsystem – system architecture - Handover - DECT system architecture – TETRA – UMTS system architecture – UTRAN – CDMA2000 - GPRS : system architecture – 802.11 system architecture - **Bluetooth system architecture – IrDa protocol – ZigBee architecture - HSPA**

Unit II : ADHOC Wireless Network

Ad Hoc Wireless Network –MAC protocol – issues in MAC protocol – Routing protocols – issues in Routing protocol - Transport Layer Protocol -issues in transport protocol - QOS – Energy Management – Security in Adhoc network

Unit III : Wireless Sensor Network

Architecture and Design – Medium Access Control – Routing – Transport Layer – power management – sensor localization – clock synchronization - Energy model Issues in wireless sensor network.

Unit IV

LTE and Advanced LTE pro – network architecture and interface – FDD air interface and radio network TD LTE air interface – network sharing – MOCN – MORAN - LTE security architecture – scheduling - VoLTE –VoWifi – Mission critical communication

Unit V

5G Technologies – overview – Non Orthogonal Multiple Access for 5G Systems Millimeter Wave Communications for 5G Networks – Visible Light Communication in 5G – Massive IMO Scheduling Protocols – Cellular 5G Access for Massive Internet of things.

EMPLOYABILITY

Course Outcomes:

Differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network.

Write networking code that uses TCP and UDP in client-server applications.

Design and implement networking protocols.

Design and implement networking applications.

REFERENCE BOOKS:

1. Jochen Schiller , Mobile Communication, Pearson, Second Edition, 2009.
2. Fei Hu and Xiaojun Cao, “ Wireless Sensor Networks Principles and Practice “ CRC Press, 2010.
3. C.Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks – Architectures and Protocols, Pearson Education, Second Edition
4. Martin Sauter,”From GSM to LTE Advanced PRO and 5G – An Introduction to Mobile Network and Mobile Broadband”, Third edition, Wiley, 2017.
5. Vinod W Wrong , Robert Schober, Derrick Wing Kwang mLi Chun Wang, Key Technologies for 5G Wireless Systems, Cambridge University Press, 2017.

203CSC13B – Big Data Analytics				
	6	0	0	5

Pre-requisite: NIL
Course Type:

Course Category: Core
Theory

Objective:

To impart knowledge in Fundamentals, Big Data Analytics, **Technologies and databases, Hadoop and Map Reduce Fundamentals**

Unit I

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment

Unit II

Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

Unit III

Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of Cassandra

Unit IV

Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures

Unit V

HadoopMapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats

Text Book

Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd., 2016

EMPLOYABILITY

Course Outcomes:

- Understand Big Data and its analytics in the real world 1
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
- Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
- Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
- Implement Big Data Activities using Hive

Reference Books

1. “Big Data” by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.
2. “Big Data Imperatives : Enterprise Big Data Warehouse, BI Implementations and Analytics” by Soumendra Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
3. “Mining of Massive Datasets”, Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman, Springer, July 2013.
4. “Hadoop: The definitive Guide”, Tom White, O'Reilly Media, 2010.

RESEARCH AND PUBLICATION ETHICS

Course Code	Course Title	L	T	P	C
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CPE_RPE	Research and publication ethics	-	-	-	2
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THEORY

Unit I: PHILOSOPHY AND ETHICS (3 hours)

1. Introduction to philosophy, definition, nature and scope, concept, branches.
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

Unit II: SCIENTIFIC CONDUCT (5 hours)

1. Ethics with respect to science and research.
2. Intellectual honesty and research integrity.
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing.
5. Selective reporting and misrepresentation of data.

Unit III : PUBLICATION ETHICS (7 hours)

1. Publication ethics: definition, introduction and importance.
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest.
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types.
5. Violation of publication ethics, authorship and contributorship.
6. Identification of publication misconduct, complaints and appeals.
7. Predatory publishers and journals.

PRACTICE

Unit IV: OPEN ACCESS PUBLISHING (4 hours.)

1. Open access publications and initiatives.
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU.

4. Journal finder / journal suggestion tools viz, JANE, Elsevier Journal Folder, Springer Journal Suggester, etc.

UNIT V : PUBLICATION MISCONDUCT (4 hours)

A. Group Discussions (2 hours)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest.
3. Complaints and appeals: examples and fraud from India and abroad.

B. Software tools (2 hours)

Use of plagiarism software like Turnitin, Urkund and other open source software tools.

UNIT VI: DATABASES AND RESEARCH METRICS (7 hours)

A. Databases (4 hours)

1. Indexing databases.
2. Citation database: Web of Science, Scopus etc.

B. Research Metrics (3 hours)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score.
2. Metrics: h-index. g index, i10 index, altmetrics.

SKILL DEVELOPMENT

DEPARTMENT OF PHYSICS

PRIST

Declared Under Section 3 of UGC Act, 1956

Thanjavur, Tamilnadu, India



PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

B.Sc., PHYSICS
REGULATION – 2020
(2022-23)

1.1.3	colour
employability	
Skill development	
ENTREPRENEURSHIP	
EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT	
EMPLOYABILITY,/SKILL DEVELOPMENT	
EMPLOYABILITY,/ENTREPRENEURSHIP	



SCHOOL OF ARTS AND SCIENCE
B.Sc., PHYSICS - REGULATION 2020

COURSE STRUCTURE
2022-23

Course Code	Course Title	L	T	P	C
SEMESTER I					
THEORY					
20110AEC11	Tamil-I	4	0	0	2
20111AEC11	Advanced English-I				
20132AEC11	Hindi-I				
20135AEC11	French-I				
20111AEC12	English-I	4	0	0	2
20113AEC13	Properties of Matter	5	1	0	4
20112AEC15A	Calculus and Fourier series	4	-	0	4
20112AEC16A	Algebra and Trigonometry	4	-	0	3
PRACTICAL					
20113SEC14L	Properties of Matter Lab	0	0	3	2
Total		21	1	3	20
AUDIT COURSE					
201ACLSICN	Indian Constitution	-	-	-	2
201ACLSUHV	Universal Human Values	-	-	-	2

SEMESTER II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21	Tamil-II	4	0	0	2
20111AEC21	Advanced English-II				
20132AEC21	Hindi-II				
20135AEC21	French-II				
20111AEC22	English-II	4	0	0	2
20113AEC23	Mechanics And special theory of Relativity	6	1	0	4
20112AEC25A	ODE,PDE and Laplace Transform	5	0	0	4
20112AEC26A	Analytical Geometry in Vector Calculus	4	0	0	3
PRACTICAL					
20113SEC24L	Mechanics Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20113RLC27	Research Led Seminar	-	-	-	1
Total		23	1	3	18
AUDIT COURSE					
201ACLSCOS	Communication Skills	-	-	-	2
201ACSSBBE	Basic Behavioral Etiquette	-	-	-	2

SEMESTER III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31	Tamil-III	4	0	0	2
20111AEC31	Advanced English-III				
20132AEC31	Hindi-III				
20135AEC31	French-III				
20111AEC32	English-III	4	0	0	2
20113AEC33	Heat and Thermodynamics	5	0	0	4
20114AEC35	Chemistry-I	6	0	0	5
PRACTICAL					
20113SEC34L	Heat and Thermodynamics lab	0	0	3	2
20114SEC36L	Volumetric Analysis lab- I	0	0	3	2
RESEARCH SKILL BASED COURSE					
20113RMC37	Research Methodology	2	0	0	2
TOTAL		21	0	6	19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2

SEMESTER IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41	Tamil-IV	4	0	0	2
20111AEC41	Advanced English-IV				
20132AEC41	Hindi-IV				
20135AEC41	French-IV				
20111AEC42	English-IV	4	0	0	2
20113AEC43	Optics	5	0	0	4
20114AEC45	Chemistry-II	6	0	0	5
201ENVTSTU	Environmental Studies	2	0	0	2
PRACTICAL					
20113SEC44L	Optics Lab	0	0	3	2
20114SEC46L	Volumetric Analysis Lab -II	0	0	3	2
TOTAL		21	0	3	19
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	2

SEMESTER V

Course Code	Course Title	L	T	P	C
THEORY					
20113AEC51	Electricity and Magnetism	5	0	0	4
20113AEC52	Atomic Physics	4	1	0	3
20113AEC53	Basic Electronics	4	1	0	4
20113DSC56_	Discipline Specific Elective – I	5	0	0	3
RESEARCH SKILL BASED COURSE					
20113BRC57	Participation in Bounded research	-	-	-	1
PRACTICAL					
20113SEC54L	Electricity and Magnetism Lab	0	0	3	2
20113SEC55L	Basic Electronics Lab	0	0	3	2
TOTAL		18	2	6	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2

SEMESTER VI

Course Code	Course Title	L	T	P	C
THEORY					
20113AEC61	Digital Electronics & Microprocessor	4	1	0	4
20113AEC62	Elements of Theoretical Physics	5	0	0	5
20113DSC65_	Discipline Specific Elective –II	5	0	0	3
201__OEC	Open Elective Course	4	0	0	2
PRACTICAL					
20113SEC63L	Digital Electronics Lab	0	0	3	2
20113SEC64L	Microprocessor Lab	0	0	3	2
20113PRW66	Project Work	-	-	-	4
20113PEE	Programme Exit Examination	-	-	-	1
TOTAL		18	1	6	23
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2
201ACLSCET	Community Engagement	-	-	-	1
TOTAL CREDITS					115
Total Credits – Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses -I
V	a) 20113DSC56A - Energy Physics b) 20113DSC56B - Polymer Science c) 20113DSC56C - Solar Energy for Environment d) 20113DSC56D - Semiconductor Physical Science e) 20113DSC56E – Electrical and Network Skills

Semester	Discipline Specific Elective Courses - II
VI	a) 20113DSC65A- Material Physics b) 20113DSC65B - Particle Physics c) 20113DSC65C - Photovoltaic for Energy Conversion d) 20113DSC65D - Physics of Radiography e) 20113DSC65E - Photonics

Open Elective Course

Semester	General Elective Courses
VI	a) 201TNOEC-Tamil IlakkiyaVaralaru b) 201ENOEC-Journalism c) 201MAOEC-Development of Mathematical Skills d) 201CEOEC-Food and Adulteration e) 201MBOEC-Wildlife Conservation f) 201CSOEC-E-Learning g) 201CAOEC-Web Technology h) 201CMOEC-Banking Service

Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	NON CGP	Total
I	15	2	-	-	-	-	20
II	15	2	-	-	1	-	18
III	13	4	-	-	2	-	19
IV	13	4	-	-	-	2	19
V	11	4	3	-	1	-	19
VI	9	4	3	2	4	1	23
Total	76	20	6	2	8	3	115

Course Code	TAMIL PAPER - I	L	T	P	C
20110AEC11		4	0	0	2

தமிழ் இலக்கியப் பண்டமாக்கியல் - வணம், தஞ்சை

பா. குதியாடு : தமிழ் முதல் பருவம்

முதலாம் ஆண்டு

இக்கலை இலக்கியம் - செம்புள், சிறுகதை , நடகம், இலக்கிய வரலாறு

பகுதி : 1. செம்புள்

தாயுமானவ சுவாமிகள் - அத்தார புலனம் - சிறும்பு நகரியம் - 40 அடிகள்

இராமலிங்க அடிகள் - திருவாய்மொழி - அருணை விண்ணப்பம் - 40 அடிகள்

அவிமணி தேசிக விநாயகம் நினைவு - மலரும் மானவயும் - 52 அடிகள்

பாரதியார் - புதுமைப்பெண் - 40 அடிகள்

பாரதிதாசன் - பாரதிதாசன் அவிதைகள் , தமிழ் இனிமை , தமிழ் அணவு

பகுதி : 2. செம்புள்

நாமக்கல் அவிதர் - தமிழ் தேன் - தமிழ் வளர்ச்சி சபை செம்புள் , 40 அடிகள்

ந.சி.சுப்பிரமணியன் - வந்தியத்தன - அவிதை சபை , 42 அடிகள்

சுரதா - தேன்பழை, அன்பை , 22 அடிகள்

சுண்ணாம்பா - இலக்கியம் , ஒரு பாணியின் கதை , 54 அடிகள்

அ.புதுவர் குமாரன் - செந்திரகுமார் , அன்பைய சிறையும் சிறுகதைகள், 80 அடிகள்

பகுதி : 3. சிறுகதை

க.சுப்பிரமணியன் - தேரில் புழங்கு பாசா

பகுதி : 4. நடகம்

கு. வெ. பாண்டிரமணியன் , செந்திரகுமார் (அரைநடை நடகம்)

பகுதி : 5. இலக்கிய வரலாறு

சிறுகதை , புதினம், நடகம் அரைநடை , அவிதை , புதுக்கவிதை

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature
-

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Essentials of Business Communication

-Rajendra Pal &J.SKorlahalli Sultan Chand & Sons

English for writers and translators

-Robin Macpherson

Technical Communication

-Meenakshi Sharma &Sangeetha Sharma

The World's Great Speeches

- Sudhir Kumar Sharma Galaxy Publishers

English Work Book-I&II

-JewelcyJawahar

Course Code	English-I	L	T	P	C
20111AEC12		4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature

UNIT –I

The Art of Reading

- Lin Yutang

An Eco-Feminist Vision

-ArunaGnanadason

UNIT – II

The Merchant of Death

-Nanda Kishore Mishra & John Kennet

She Spoke for all Nature

-Young world ‘The Hindu’

UNIT –III

Because I could not Stop for Death

-Emily Dickinson

Stopping by Woods on a Snowy Evening

-Robert Frost

UNIT –IV

Enterprise

-Nissim Ezekiel

Love poem for a wife

-A.K Ramanujam

(SKILL DEVELOPMENT)

UNIT –V

Oliver Twist

-Charles Dickens

References:-

The Art of Reading/ Experiencing Poetry.

-S.Murugesan and Dr.K.Chellappan
Emerald Publishers

Course Code	Core Paper - I Properties Of Matter	L	T	P	C
20113AEC13		6	1	0	6

Aim:

The course presents an introduction to the physics of the objects whose sizes span from atomic dimensions to macroscopic, human scale dimensions, and beyond: atoms, molecules, gases, liquids, and solids. The aim is to show how the properties of macroscopic bodies can be derived from the knowledge that matter is made up from atoms.

Objectives:

Recognize the difference between physical and chemical properties
Distinguish between extensive and intensive properties

UNIT – I Elasticity:

Stress – Strain – Hooke’s law – Relation between elastic constants – poisson’s Ratio – Expression for poisson’s ratio in terms of elastic constants – work done in twisting –Torsional pendulum – determination of rigidity modulus – Young’s modulus – determination – uniform – non-uniform bending.

UNIT – II Surface Tension:

Definition, Explanation of surface tension– Surface energy and surface tension – Pressure difference across a liquid surface – Excess of pressure inside a soap bubble – Angle of contact – Measurement of angle of contact – Experimental determination of surface tension by Jaegers method - Capillary rise method – Surface tension and vapour pressure over a liquid surface – Effect of Evaporation and condensation.

UNIT – III Viscosity:

Definition – flow of liquid through a capillary tube – Stokes Law – Poiseuille’s method for coefficient of viscosity – conception of poiseuille’s equation-Ostwald’s viscometer – viscosity of highly viscous liquids – Stokes method – variation of viscosity of a liquid with temperature – viscosity of Gases and kinetic energy.

UNIT – IV Diffusion – Osmosis:

Osmosis and osmotic pressure – Laws of osmotic pressure – Experimental determination of osmotic pressure – Prefer method – Berkley method – Elevation of Boiling point and Depression of freezing point – Diffusion – Fick’s law – Experimental measurement of Diffusivity – Graham’s Laws of Diffusion of Gases – Effusion, Transpiration and Transfusion.

UNIT - V Gravitation:

Newton's Law – Kepler's Law –Deductions of Newton's law from Kepler's Law – Law of Gravitation– Gravitational potential: Potential energy – Gravitation Potential and Field at a point due to spherical shell, solid sphere, Hollow sphere – Satellites – Stationary satellite – Escape velocity – Rocket – Jet plane.

(EMPLOYABILITY)

Learning outcomes:

On completion successful students will be able to demonstrate an understanding of:

1. The relationships between physics on the atomic scale and the properties of matter.
2. The roles played by microscopic states of system, their numbers and their accessibility.
3. Techniques for finding appropriate averages to predict macroscopic behavior.
4. How these techniques are applied to the calculation of the properties of matter.

Reference:

1. Properties of matter – Subramaniaiyer and Jeyaraman.
2. Elements of properties of matter – D.S. Mathur, S Chand and Co.,
3. Properties of Matter – Brijlal and Subramaniam, S. Chand and Co.,

Course.Code	PROPERTIES OF MATTER LAB	L	T	P	C
20113AEC14L		0	0	3	2

List of Experiments

1. Young's modulus – uniform bending – pin and microscope.
2. Young's modulus – non uniform bending – scale and telescope .
3. Static torsion – Rigidity modulus.
4. Torsion pendulum – Rigidity modulus.
5. Cantilever depression – scale and telescope method.
6. Surface tension – capillary rise method.
7. Viscosity – capillary flow method.
8. Newton's ring –determination of R.
9. Compound pendulum.
10. Long focus convex lens – f, R, u determination.

Course Code	Allied Paper - I Calculus and Fourier Series	L	T	P	C
20112AEC15A		4	0	0	4

Aim and objectives:

This paper aims at enabling the students to know various concepts and principles of differential and integral calculus.

Sound Knowledge of calculus is essential for the students of mathematics for the better perceptions of the subject and its development

Unit – I

Leibnitz theorem (Proof not needed) and its applications – curvature and radius of curvature in Cartesian only (Proof not needed) – total differential coefficient (Proof not needed) – Jacobians of two & three variables – Simple problems in all these.

Unit – II

Reduction formula (when n is a +ve integer) for (i)

i. $\int_a^b e^{ax} x^n dx$

ii. $\int_a^b \sin^n x dx$

iii. $\int_a^b \cos^n x dx$

iv. $\int_0^x e^{ax} x^n dx$

v. $\int_0^x \sin^n x dx$

vi. without proof $\int_0^x \sin^n x \cos^n x dx$ and illustrations

Unit – III

Beta and Gamma functions

Unit – IV

Evaluation of double and triple integrals in simple cases – changing the order and evaluating of the double integration (Cartesian only)

[ENTERPRENEURSHIP]

Unit – V

Definition of Fourier series – Finding Fourier coefficients for a given periodic function with period 2π and with period $2l$ – use of odd and even functions in evaluating Fourier coefficients – half range sine and cosine series.

Outcomes:

- Calculate definite integral values using Beta and Gamma Functions
- Develop the skill of evaluating Laplace and inverse Laplace transform to solve Linear systems under initial and boundary conditions

Text Books

Calculus – T.K.M. Pillai

Trigonometry & Fourier Series – T.K.M. Pillai.

Course Code	Allied Paper - II Algebra and Trigonometry	L	T	P	C
20112AEC16A		4	0	0	4

Aim and Objectives:

This paper emphasizes general techniques of problemsolving and explores the creation of mathematical patters. It aims at introducing a course that initiates the students into the world of Discrete Mathematics.

Unit – I

Binomial, Exponential & Logarithmic series (Formulae only) – Summation

Unit – II

Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices – Characteristics equation, Eigen values, Eigen vector – Cayley Hamilton’s theorem (proof not needed) Simple application only.

Unit – III

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and $\sin^n \theta$, $\cos^n \theta$, $\sin^n \theta \cos^m \theta$ (m & n being a positive integer) – Expansion of in a series of sines and cosines of multiples of θ (θ – given in radius) Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of powers of θ (only problems in all the above)

Unit – IV

Euler’s formula for $e^{i\theta}$ – definition of hyperbolic functions – formulae involving hyperbolic functions – relation between hyperbolic and circular function – expansion of $\sinh x$, $\cosh x$, $\tanh x$ in power of x.

Unit – V

Expansion of inverse hyperbolic function – $\sinh^{-1} x$, $\cosh^{-1} x$ and $\tanh^{-1} x$ - Separation of real and imaginary parts of $\sin(x+iy)$, $\cos(x+iy)$, $\tan(x+iy)$, $\sinh(x+iy)$, $\cosh(x+iy)$, $\tanh(x+iy)$

[ENTERPRENEURSHIP]

Outcomes:

The topic like Mathematical Logic, Set Theory, Relations, Functions, Mathematical Induction, Recursive relations and Matrices.

Text Books:

T.K.M. Pillai, T.Natarajan, K.S. Ganapathi, **Algebra, Vol I**. S.ViswanathanPvt.Ltd., Chennai – 2004

S.Narayanan,T.K.M.Pillai, **Trigonometry**, S.ViswanathanPvt.Ltd. & Vijay Nicole imprint Pvt. Ltd. 2004

Course Code	Skill Based Elective Package Lab - I	L	T	P	C
20120SEC01AL		0	0	2	1

MS-WORD

1. Prepare a bio-data with photo using text styles.
2. Prepare a college course details with headings, bullets and numbering.
3. Prepare a document in a newspaper format with header and footer.
4. Create a calendar by using auto format.
5. Prepare a contemporary letter using templates.
6. Picture Insertion and Alignment
 - a. Prepare a Greeting Card
 - b. Prepare a Handout
7. Create a Mark sheet using tables and find out the total marks.
8. Prepare a Business letter for more than one company using Mail Merge

Course Code	Skill Based Elective -I	L	T	P	C
20160SEC01B	Effective Communication	0	0	2	1

UNIT I

Effective communication I

Oral Communication: Listening skills -Speaking skills (what to say and how to say it) – Gender neutral Language-Conflict, criticism, anger- Telephone skills.

UNIT II

Effective communication II

Written Communication: Mechanics of writing, letters, notes, and reports- Resume preparation Faxes- Web sites- Email and Memos.

Nonverbal Communication: Behavior, Body language and Attitude.

Course Code	Communicative English-I	L	T	P	C
20111SEC01L		0	0	1	1

Aim:

- To acquaint with the basic grammar

Objective:

- To know English grammar and all the concomitant linguistic items
- To be aware of basic concepts related to the study of communication
- To understand the types of sentences and its patterns

Outcome:

- Understand grammar

UNIT –I

Noun

Pronoun

Adjective

UNIT – II

Verb

Adverb

UNIT –III

Conjunction

Preposition

Interjection

UNIT – IV

Kinds of Sentences

UNIT –V

Patterns of sentences

[ENTERPRENEURSHIP]

References:-

A Practical English Grammar
English Grammar

-A.J Thomson and A.V.Martinet
-Wren and Martin

Course Code	Indian constitution	L	T	P	C
201INDCONS		1	0	0	1

Aim and Objectives:

1. To make the students understand about the Democratic Rule and Parliamentary Administration.
2. To appreciate the salient features of the Indian Constitution.
3. To know the fundamental Rights and Constitutional Remedies.
4. To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
5. To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

UNIT I: THE MAKING OF INDIAN CONSTITUTION

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: FUNDAMENTAL RIGHTS AND FUNDAMENTAL DUTIES OF THE CITIZENS

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties .

UNIT III: DIRECTIVE PRINCIPLES OF STATE POLICY

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: THE UNION EXECUTIVE, UNION PARLIAMENT AND SUPREME COURT

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister Rajya Sabha- Lok Sabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.
[SKILL DEVELOPMENT]

UNIT V: STATE COUNCIL – ELECTION SYSTEM AND PARLIAMENTARY DEMOCRACY IN INDIA

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

Outcomes

1. Democratic values and citizenship Training are gained.
2. Awareness on Fundamental Rights are established.
3. The functions of union Government and State Governments are learnt.
4. The power and functions of the Judiciary learnt thoroughly.
5. Appreciation of Democratic parliamentary Rule is learnt.

REFERENCES:

1. Palekar S.A. Indian Constitution Government and polities, ABD Publications, India.
2. AiyerAlladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. KashyapSubash C Our Parliament, National Book, Trust New Delhi 1989.

Course.Code	TAMIL PAPER - II	L	T	P	C
20110AEC21		4	0	0	2

வினா. திருநெல்வாய் பக்கவாசல்புறம் - வால்வாடி, தஞ்சாவூர்

பா. குறியாறு : தமிழ் இலக்கியம் பகுதி

முதலாம் பித்திரம்

செட்டி, பத்தி இலக்கியம், சிற்றிலக்கியம், இலக்கிய வரலாறு

பித்திரம் : 1. செட்டி:

1. திருநெல்வாய் பகுதி - தஞ்சாவூர் பகுதி
2. திருநெல்வாய் பகுதி - தஞ்சாவூர் பகுதி - தஞ்சாவூர் பகுதி
3. சிற்றிலக்கியம் - திருநெல்வாய் பகுதி
4. பக்கவாசல்புறம் - திருநெல்வாய் பகுதி

பித்திரம் : 2. செட்டி:

5. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
6. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
7. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
8. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி

பித்திரம் : 3. செட்டி:

9. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
10. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
11. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி
12. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி

பித்திரம் : 4. பகுதி

13. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி

பித்திரம் : 5. இலக்கிய வரலாறு

14. திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி, (திருநெல்வாய் பகுதி - திருநெல்வாய் பகுதி)

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT – I

E-mail

Fax

Memos

UNIT – II

Itinerary

Checklist

UNIT – III

Invitation

Circular

UNIT – IV

Instruction

Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma &Sangeetha Sharma

Inspiring Lives

-Maruthi Publishers

English Work Book-I&II

-JewelcyJawahar

Course Code	English Paper -II	L	T	P	C
20111AEC22		4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To empower students to acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – I

Ecology	-A.K. Ramanujan
Gift	-Alice Walker
The First Meeting	-Sujata Bhatt

UNIT –II

Fueled	-Marcie Hans
Asleep	-Ernst Jandl
Buying and selling	-Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival	- Chief Seattle
My Wood	- E.M.Forster
The Meeting of Races	- Rabindranath Tagore

UNIT – IV

The Refugee	-K.A. Abbas
I Have a Dream	-Martin Luther king
Those People Next Door	-A.G. Gardiner

UNIT – V

Marriage is a private Affair	-Chinua Achebe
The Fortune Teller	-Karel Capek
Proposal	-Anton Chekov

[SKILL DEVELOPMENT]

References:-

Gathered Wisdom -GowriSivaramanEmeraldPublishers

CourseCode	Core Paper - II Mechanics and Special Theory of Relativity	L	T	P	C
20113AEC23		6	1	0	6

Aim:

To deepen understanding of Mechanics.

To prepare students for courses in quantum field theory and gauge theory

Objectives:

Find the unitary transformations linked to symmetry operations.

Apply time-dependent perturbation theory to variety of problems.

Unit I :Dynamics projectile , impulse, impact

Projectile - range of horizontal and inclined plane – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – Motion of two interacting bodies – reduced mass.

Unit II: Dynamics of Rigid bodies

Kinetic energy of rotation - Theory of compound pendulum - Equivalent simple pendulum – Reversibility of centers of oscillation and suspension - Determination of 'g' and radius of gyration of a bar pendulum-period of oscillation of a Bifilar pendulum with Parallel threads.

Center of mass - velocity and acceleration of center mass - system of variable mass-equation for a rocket – Conservation of linear and angular momentum.

Unit III: Center of Gravity and states of equilibrium:

Center of gravity of simple bodies – Center of gravity of solid hemisphere, hemispherical bowl, and right solid cone – stable, Unstable and neutral equilibrium of a rigid body supported about an axis.

Unit IV: Center of Pressure:

Center of pressure of vertical rectangular Lamina – Vertical triangular lamina – Vertical circular lamina – Atmospheric Pressure – Variation of atmospheric pressure with altitude – Hydro dynamics – stream line flow of an ideal fluid – equation of continuity of flow – Bernoulli's theorem and its applications to liquids.

Unit V: Special theory of relativity:

Frame of reference – Newton's relativity – Inertial frame of reference – Galilean transformations – Transformation of position , velocity and acceleration – time dilation & length contraction – Lorentz Transformations – Mass –Energy relation– variation of mass with velocity.

[EMPLOYABILITY]

Learning Outcomes:

Derive a mathematical description of quantum motion in electromagnetic fields.

Apply the relativistic wave equations to simple single-particle problems.

Books for Study:

1. Mechanics – Part I and II – NarayanaMoorthy
2. Mechanics – D.S. Mathur
3. Mechanics – Brij.Lal and N. Subramaniam

Course Code	Core Practical – II Mechanics Lab	L	T	P	C
20113AEC24L		0	0	3	2

List of Experiments

1. Characteristics of junction diode.
2. Characteristics of Zener diode.
3. Potentiometer – low range voltmeter calibration.
4. Potentiometer – specific resistance.
5. Transistor characteristics –CE configuration.
6. Spectrometer - μ of a solid prism.
7. Air wedge – thickness of a wire.
8. Specific heat capacity of liquid – Newton’s law of cooling.
9. Thermal conductivity of a bad conductor- lee’s disk.
10. Carey fosters bridge – specific resistance measurement.

Course Code	Allied Paper - III ODE, PDE And Laplace Transform	L	T	P	C
20112AEC25A		4	0	0	4

Aim:

Introduce the Concepts of laplace and fourier transforms

Objectives:

Find the Fourier series representation of a function of one variable

Find the solution of the wave,diffusion and Laplaceequations using the Fourier series.

UNIT I:

Ordinary differential equations of first order but of higher degree- Equations solvable for x and y – solvable for dy/dx, clairaut’s form (simple case only)- homogeneous linear differential equation(Variable coefficients), variation of parameter.

UNIT II:

Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions- definition of general, particular and complete solution – singular integral(Geometrical meaning not required) solution of first order equations in the slandered forms $f(p,q)=0$, $f(x,p,q)=0$, $f(z,p,q)=0$ $f_1(x,p)=f_2(y,p)$ $z=(x,p+yq=f(p,q)$.

UNIT III:

Lagrange’s method for solving $P_p + Q_q = R$ where p,q,r functions of X, Y, Z- (geometrical meaning is not needed)- (only problem in all the above- No proof needed for any formula) Cherpit’s method The four standard forms.

UNIT IV:

Laplace Transforms- Definitions-

$L(e^{at})$ $L(\cos at)$, $L(\sin at)$, $L(t^n)$ where n is a positive integer – Basic theorem in Laplace transform (Statement only) $L(e^{-st} \cos bt)$, $L(e^{-st} \sin bt)$, $L[e^{-st} f(t)]-L[F(t)$, $L[f(t)]$, $L[f'(t)]$

[ENTERPRENEURSHIP]

UNIT V:

Inverse Laplace transform related to the above standard forms- solving second order ODE with constant coefficients using Laplace transforms and simultaneous equation, variable coefficients. Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions change of interval — Half range series.

Outcomes:

Solve an initial value problem for an n th order ordinary differential equation using the Laplace transform.

Solve a Cauchy problem for the wave or diffusion equations using the Laplace,

Text Books

Differential Equations - S. Narayanan

Differential Calculus T.K.M Pillai & S. Narayanan

Differential Calculus - M.L. Khanna

Course Code	Allied Paper - IV 3D Vector Calculus	L	T	P	C
20112AEC26A		4	0	0	4

Aim and Objective:

The course is designed to lay a strong foundation of Geometry and Vector Calculus.

UNIT – I

Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative - unit normal vector- tangent plane

Unit- II

Divergence- Curl – Solenoidal&Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.

Unit –III

Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential- work done by d Force- Surface integrals – Volume integrals.

Unit –IV

Gauss divergence theorem ,Stoke’s theorem (statement, application & verification only)

Unit –V

Equation of sphere – Tangent plane – plane section of a sphere – Finding the centre& radius of the circle of integration – sphere through the circle of integration (only problem in all above)

[ENTERPRENEURSHIP]

Outcomes:

- Vector calculus plays an important role in deferential geometry and in the
- study of partial deferential equations. It is used extensively in physics and
- engineering, especially in the description of electromagnetic ends, gravitational elysian uid dynamics.

Text Book

Analytical Geometry (3D) & Vector calculus, T.K. Manickavasagem Pillai, , New Gamma Publishing House, 1991

CourseCode	Skill Based Elective- II Package Lab- II	L	T	P	C
20120SEC02AL			0	0	2

MS –EXCEL

1. Prepare the addressing methods in excel
2. Prepare an Excel Document using different type of Functions.
3. Draw a Graph by using your own data
4. Prepare an Individual Pay Bill preparation for an employee in an organization.
5. Prepare a Mark List for the Students.
6. Prepare a Worksheet for a Company.
7. Prepare an Inventory Report for a Shop.
8. Prepare an Electricity Bill for the Domestic Customers.

Course Code	Skill Based Elective -II	L	T	P	C
20160SEC01B	Self Development	0	0	2	1

UNIT I

Self -Assessment

Self-Assessment, Self-Awareness, Self-Esteem, Personal success factors, handling failure, Depression and Habit, Self appraisal, SWOT analysis Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Personal Goal setting, Career Planning, Building of Self Confidence, prioritization.

UNIT II

Self- Management

Managing Time, Managing Stress, Conflict Management

Course Code	Communicative English-II	L	T	P	C
20111SEC02L		0	0	2	1

Aim:

- To acquaint with the basic grammar

Objective:

- To learn about the auxiliary and the models
- To understand the different tenses and use it in sentences
- To know where to use and where not to use the articles
- To familiarize with the participle

Outcome:

- Understand grammar

UNIT –I

Auxiliaries

UNIT –II

Modals

UNIT –III

Tenses-Simple, Perfect

UNIT –IV

Tenses-Continuous, Perfect continuous

UNIT –V

Articles

Participle

Reference

A Practical English Grammar
English Grammar

-A.J Thomson and A.V.Martinet
-Wren and Martin

Course Code	TAMIL PAPER - III	L	T	P	C
20110AEC31		4	0	0	2

தமிழ்நிலைப் பரீட்சைக்காகும் - வல்வம், தஞ்சாவூர்

பாட குறியாடு :

தமிழ் மூன்றாம் பகுதி

இரண்டாம் ஆண்டு

செய்யுள், அட்வியங்கள் இலக்கிய வரலாறு

செய்யுள்

அககு : 1

1. சிவப்பதினாரம் - மனைவறம் படுத்தி காதை
2. மணிமொகை - ஆதினா செனையிட்ட காதை
3. சிவசந்திரமணி - விமலகாற் இவம்பம்

அககு : 2

4. பெரியபுராணம் - இணையான் குடிமார நம்பனார் புராணம்
5. அம்பராமபணம் - கைகவி குழுவிலைப் படவம்

அககு : 3

6. சீராம்புராணம் - நடு அககுதாரப் படவம் - 24 வரிசை
7. தேய்வகணி - வாமன் ஆட்சி படவம் - முதல் 5 பாடல்கள்

அககு : 4

8. நனவெண்பா - வாய்வர காண்பம் (20 - 51)

அககு : 5 : இலக்கிய வரலாறு

9. அட்வியங்கள் , ஐஞ்சிறு அட்வியங்கள் , புராணங்கள் , இதினாசங்கள்

Course Code	Course Title	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech

Classification of speech sounds

Vowels and Diphthongs

UNIT –II

Consonants

Consonant cluster

UNIT – III

Syllable

Word accent

Intonation

UNIT – IV

Idiom

Interpretation of graphics

UNIT – V

Slogan writing

Writing advertisement

References:

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Technical Communication-Meenakshi Sharma & Sangeetha Sharma

A text book of Phonetics for Indian Students -T.B. Balasubramaniyan

Course Code	English Paper -III	L	T	P	C
20111AEC32		4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – I

The Doctor's World	- R.K. Narayan
The Postmaster	- Rabindranath Tagore
Princess September	- E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	- Norah Burke
Uneasy Home Coming	- Will F. Jenkins
Resignation	- Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

[SKILL DEVELOPMENT]

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

References:-

Nine Short Stories	-SteuartH.King Blackie Books
One-Act plays of Today	-T.Prabhakar Emerald Publishers

Course Code	Core Paper - III Heat and Thermodynamics	L	T	P	C
20113AEC33		5	0	0	6

Aim:

To develop the ideas of classical thermodynamics

To deepen the appreciation of the link between the microscopic properties of individual atoms or other particles and the macroscopic properties of many-body systems formed from them

To demonstrate the power of statistical methods in physics

Objectives:

Demonstrate an understanding of the first and second laws of thermodynamics, and of the concept of entropy.

Explain and derive the fundamental thermodynamic relation.

Unit – I: Thermodynamics

Transport Phenomenon – Viscosity- Thermal conductivity – Diffusion – Experimental confirmation of kinetic theory – Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process – Carnot’s theorem – Second law of thermodynamics – Entropy – Change of entropy in reversible and irreversible processes.

Unit – II: Low Temperature

Joule – Thomson’s effect – Porus plug experiment – Liquefaction of gases – Adiabatic expansion process – adiabatic demagnetization – practical application of low temperature – Refrigerating mechanism – Electrolux refrigeration – Air conditioning machines.

Unit – III: Radiation

Radiation – Stefan’s law – Boltzmann law – Black body – Rayleigh radiation – Rayleigh-Jeans law – Stefan fourth power law – Pyrometry – Solar constant – Sources of solar energy .

Unit – IV: Specific Heat

Specific heat of solids – Dulong and Petit’s law – Einstein’s theory of specific heat – Debye’s theory – Specific heat of gases – Variations of specific heat of Diatomic gases – Quantization of various contributions to energy of a diatomic molecules.

Unit – V: Statistical Physics:

Quantum statistics of identical particles – M.B statistics – Ideal gas - B.E statistics – Specific heat - F.D. Statistics – Richardson equation –Comparison of M.B,B.E and F.D statistics.

[EMPLOYABILITY]

Learning Outcomes:

Use the formalism of thermodynamics, including the thermodynamic potentials and Maxwell's relations, and apply these tools to simple systems in thermal equilibrium.

Explain the basic concepts of statistical mechanics, including the derivation of the general formula for entropy in terms of the ensemble partition function.

Explain the statistical origin of the second law of thermodynamics; and

Construct a partition function for a system in thermal equilibrium and use it to obtain thermodynamic quantities of interest.

Books for Reference:

- 1) Heat and Thermodynamics – J.B. Rajam and C.L. Arora.
- 2) Thermodynamics and Statistical Physics – Sharma and Sarkan.
- 3) Heat and Thermodynamics – Brijlal and Subramanian.
- 4) Statistical Mechanics – Satyaprakash and C. Agarwal.

Course Code	Core Practical – III Heat and Optics Lab	L	T	P	C
20113AEC34L		0	0	3	2

List of Experiments

- 1) Sonometer – Verification of laws.
- 2) Stokes method – Viscosity of highly viscous liquid.
- 3) P.O. Box – Temperature coefficient.
- 4) Potentiometer – Calibration of high range voltmeter.
- 5) Spectrometer – i-d curve.
- 6) Joule’s calorimeter – Specific heat capacity.
- 7) Study of logic gates – discrete components.
- 8) Potentiometer – Calibration of ammeter.
- 9) Spectrometer – Grating – normal incidence method.
- 10) Emissive power of a surface – Spherical calorimeter.

Course Code	Allied Paper -II	L	T	P	C
20114AEC35	Inorganic, Organic and Physical Chemistry- I	4	0	0	4

UNIT- I : Polar effect:

Inductive effect +I and – I groups, relative strength of – foamic , acetic and propionicacids – acetic and chloroacetic acids – ammonia and methyl amine. Resonance – resonating structure of benzene, butadiene and COOH groups – conditions – applications (resonance energy and stability). Acidic & basic properties of phenol & aniline. Hyperconjugation.- consequence of hyperconjugation. Steric effects – Steric accelerated reaction and steric inhibited reaction.

UNIT –II : Industrial chemistry

Fuel gases – Watergas, products gas, L.P.G gas, Gobar gas and natural gas. Fertilizers – NPK and mixed fertilizers, micronutrients, and their role in plant life and biofertilizers, soap and detergents an elementary idea about preparation cleaning action of soap detergents.

UNIT III : Aromatic compounds :

structure, stability, resonance and aromaticity of benzene. Substitution reactions, Nitration, Halogenation and Alkylation Naphthalene Isolation, Synthesis, properties, and structural elucidation and uses .Organic compounds: Benzoin, Perkin, Cannizzaro, Claisen reactions. Chemotherapy: Definition and uses of Antibiotic, Analgesic Antibacteria, Antiviral, Antidiabetic, Antihypertensive, Antiseptic and disinfectant, Antimalarial- Anaesthetics – local and general.

[ENTERPRENEURSHIP]

UNIT –IV :Energetic:

Review first law of thermodynamic state and path functions need for the second law Carnot cycle and thermodynamic scale of temperature spontaneous and non spontaneous process and Third law.

UNIT – V : Chemical kinetics:

Order of reactions and their determinations. Activation energy, effect of temperature on reaction rate. Catalysis Types, mechanism of catalytic reactions, industrial applications.

References:

1. R.D.Madan, J.S.Tiwari and G.L.Mudhara, A Text Book of First Year B.Sc. Chemistry, S . hand & Co.
2. G.S. Manku, Theoretical Principles of Inorganic chemistry, Tata McgrawHill, New Delhi.
3. Paula Yaukanis Bruice – Organic chemistry, prentice Hall.
4. J.D.Lee, concise inorganic chemistry, 5th Edition, Blackwell Science Ltd, Oxford, 2002.
5. B.S.Bahl and Arun Bahl, Advanced Organic chemistry, S.Chand and Co., New Delhi
6. B.R.Puri and Sharma, principles of physical chemistry.
7. K.S.Tiwari, N.K.Vishnoi and S. N. Mehrotra, A Text book of Organic chemistry, Vikas publishing House Pvt. Ltd., New Delhi, 2004.

Course ode	Volumetric Analysis Lab- I	L	T	P	C
20114AEC36L		0	0	3	2

1. Strong acid vs Strong base.
2. Weak acid vs Strong base
3. Estimation of ferrous sulphate.
4. Estimation of oxalic acid.
5. Estimation of copper.
6. Estimation of potassium dichromate
7. Estimation of potassium permanganate

Course ode	Research Methodology	L	T	P	C
20113RMC37		3	0	0	3

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

[SKILL DEVELOPMENT]

UNIT V: Laboratory Safety

General guidelines. Hygiene – Eye, foot, skin and hand protection – Safety rules - Equipment protection – Respiratory protective equipment – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. R.Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.
6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill

Course Code	Skill Based Elective -III Package Lab - III	L	T	P	C
20120SEC03AL		0	0	2	1

POWER POINT

1. Create a slide show presentation for a Seminar (choose your own topics)
 - a. Enter the Text in the Outline View
 - b. Create Non-Bulleted and Bulleted Text
2. Create a slide show presentation for a Science Exhibition
 - a. Create Non-Bulleted and Bulleted text
 - b. Apply appropriate Text Attributes
3. Create slide show presentation for an Invitation
 - a. Insert an Object from a Bitmap File
 - b. Apply appropriate Text Attributes
 - c. Rotate the Object to 45 degree
 - d. Apply Shadow to the object
4. Create a slide show presentation to display percentage of marks in each semester for all Students
 - a. Use Bar chart (x-axis: semester; y-axis: % of marks)
 - b. Use different Presentation Template and different Transition Effect for each slide
 - c. Use different Text Attributes in each slide
5. Create a slide show presentation for a Shop Advertisement to be open shortly
6. Create a slide show presentation to display Percentage of Sales in each quarter for the any Vendor using bar chart (x-axis: Quarter; y-axis: % of sales)
7. Create a slide show presentation for Tourists Places
8. Create a slide for Calendar using appropriate Text attributes and insert an object from a Bitmap file

Course Code	Skill Based Elective-III	L	T	P	C
20160SEC03B	Interpersonal Relations and Social Responsibilities	0	0	2	1

UNIT I

Interpersonal Relations

Nature of groups and teams, Team effectiveness, Group discussions and decision making, Emotional Intelligence (EI) and Emotional Quotients (EQ), and its effect on team, Cross Cultural Aspects, Inter dependence, Peer Reviews.

UNIT II

Ethics and Social Responsibilities

Personal professional and corporate ethics, Ethical dilemma, Corporate social responsibilities: Green computing, Social accounting, Auditing, Civic sense.

Course Code	Communicative English-III	L	T	P	C
20111SEC03L		0	0	2	1

Aim:

- To acquaint with the basic grammar

Objective:

- To familiarize with the clauses and phrases
- To learn the different degrees of comparison
- To change a sentence from active to passive and vice versa
- To know where to use punctuations
- To frame sentences
- To know the features, process, forms and barriers of communication

Outcome:

- Understand grammar

UNIT –I

Clauses

Phrases

UNIT –II

Degrees of comparison

UNIT –III

Active and Passive

UNIT –IV

Communication

Characteristics -Process -Forms - Barriers

UNIT –V

Punctuation

Forming sentences

[SKILL DEVELOPMENT]

References:-

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

- Wren and Martin

-Meenakshi Sharma &Sangeetha Sharma

Course Code	TAMIL PAPER; - IV	L	T	P	C
20110AEC41		4	0	0	2

தமிழ் இலக்கியப் பங்களிப்புகள் - கவிதை, தந்திரங்கள்

பா. குறிஞ்சி : தமிழ்.

நான்காம் பகுதி இலக்கியப் பிழைப்பு

கவிதை , கவி இலக்கியம், தந்திர இலக்கியம் , கவிதை , இலக்கிய வரலாறு

பகுதி . 1 : பன்னாட இலக்கியம் - நந்திரங்கள்;

1. கவிதை - கவிதை கற்று - பா.க் கணி . 11
2. குறிஞ்சி - கவிதை கற்று - பா.க் கணி . 64
3. பன்னாட - கவிதை கற்று - பா.க் கணி . 142
4. பன்னாட - நந்திரம் கற்று - பா.க் கணி . 29
5. கவிதை - கவிதை கற்று - பா.க் கணி . 70

பன்னாட இலக்கியம் குறிஞ்சி

- 1 . குறிஞ்சி - கவிதை கற்று - பா.க் கணி . 1
2. பன்னாட - கவிதை கற்று - பா.க் கணி . 167
3. கவிதை - கவிதை கற்று - பா.க் கணி . 181
4. கவிதை - கவிதை கற்று - பா.க் கணி . 290
5. பன்னாட - கவிதை கற்று - பா.க் கணி . 347

பன்னாட இலக்கியம் நந்திரங்கள்

1. கவிதை - கவிதை கற்று - பகுதி இலக்கியம் பா.க் கணி
2. கவிதை - கவிதை கற்று - பகுதி இலக்கியம் பா.க் கணி
3. குறிஞ்சி - கவிதை கற்று - பகுதி இலக்கியம் பா.க் கணி
4. பன்னாட - கவிதை கற்று - பகுதி இலக்கியம் பா.க் கணி
5. பன்னாட - கவிதை கற்று - பகுதி இலக்கியம் பா.க் கணி

பகுதி . 2 : கவிதை

- 1 . பன்னாட - பா.க் கணி . 2
2. குறிஞ்சி - பா.க் கணி . 37

நீதித் திருத்தங்கள் பன்னாட்டுமொழி அமைதி, தந்திரம்

பா. குறிப்பிடு : குறிப்பு.

நாங்கள் பகுதி இரண்டாம் ஆண்டு

செய்தல் , சர்க இலக்கியம், 24 இலக்கியம் , செப்பெழுதி , இலக்கிய அமைதி

பகுதி . 1 : பன்னாட்ட இலக்கியம் - நன்றினை;

1. செய்தல் - செய்தி கூற்று - பா.க் கண் . 11
2. குறிப்பிடு - தகவலி கூற்று - பா.க் கண் . 64
3. பன்னாட்ட - தகவலி கூற்று - பா.க் கண் . 142
4. பன்னாட்ட - நன்றி கூற்று - பா.க் கண் . 29
5. செய்தல் - தகவலி கூற்று - பா.க் கண் . 70

பன்னாட்ட இலக்கியம் குறிப்பிடுகளை

- 1 . குறிப்பிடு - செய்தி கூற்று - பா.க் கண் . 1
2. பன்னாட்ட - செப்பெழுதி கூற்று - பா.க் கண் . 157
3. செய்தல் - தகவலி கூற்று - பா.க் கண் . 181
4. செய்தல் - தகவலி கூற்று - பா.க் கண் . 290
5. பன்னாட்ட - தகவலி கூற்று - பா.க் கண் . 347

பன்னாட்ட இலக்கியம் நன்றிக்குறிப்பு

1. செய்தல் - கண்ணி செய்தல் - பன்னாட்ட இரண்டு பா.க்கள்
2. செய்தல் - செய்திக்குறிப்பு செய்தல் - பன்னாட்ட இரண்டு பா.க்கள்
3. குறிப்பிடு - குறிப்பு குறிப்பு செய்தல் - பன்னாட்ட இரண்டு பா.க்கள்
4. பன்னாட்ட - இரண்டிடு செய்தல் - பன்னாட்ட இரண்டு பா.க்கள்
5. பன்னாட்ட - பன்னாட்ட செய்தல் - பன்னாட்ட இரண்டு பா.க்கள்

பகுதி . 2 : கவிஞர்களை

- 1 . பன்னாட்ட - பா.க் கண் . 2
2. குறிப்பிடு - பா.க் கண் . 37

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

References:

- English Grammar -Wren and Martin
 English Grammar and Composition -Radhakrishna Pillai
 Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons
 Technical Communication-Meenakshi Sharma &Sangeetha Sharma
 English for writers and translators -Robin Macpherson
 English Work Book-I&II -JewelcyJawahar

Course Code	English Paper -IV	L	T	P	C
20111AEC42		4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Read and comprehend literature

UNIT –I

How to be a Doctor -Stephen Leacock
 My Visions for India -A.P.J. Abdul Kalam
 Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning
 The Toys -Coventry Patmore
 I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin
 The Verger -W.S Maugham
 A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth
 As You Like It

UNIT –V

Henry IV
 Tempest

[SKILL DEVELOPMENT]

References:-

English for Enrichment -Devaraj Emerald Publishers
 Selected Scenes from Shakespeare Book I &II -Emerald Publishers

Sub. Code	Core Paper - IV	L	T	P	C
20113AEC43	Optics	6	1	0	6

Aim:

To introduce geometric optics and the use of ray diagrams using lenses and mirrors.

To understand how simple optical instruments work.

Objectives:

Produce ray diagrams to predict the position and size of the image produced by simple lenses. Measure the focal length of a simple convex lens by producing an image of a distant object. Calculate the focal length of a simple lens by making measurements of image and object distance and using the lens equation.

Unit – I: Geometrical Optics

Thick lens – Principal foci and principal points – Thick lens formulae – Power of a thick lens – Nodal points – Optical centre of a lens.

Chromatic, chromatic combination of lenses, Aberrations: Spherical aberration – Methods of reducing spherical aberration – Coma – Aplanatic surface – Astigmatism – Curvature of the field.

Unit – II: Optical Instruments

Kellner’s eyepiece – Ramsden’s eyepiece – Huygen’s eyepiece. Rayleigh’s criterion, Resolving power of Optical Instruments: Resolving power – Resolving power of Telescope, Microscope, Prism and Grating.

Unit – III: Interference

Colours of thin films – Air wedge – Newton’s rings – Brewster’s fringes – Michelson Interferometer and its applications – Fabry-Perrot Interferometer – Interference filter – Stationary waves in light – Colour photography – Holography.

Unit – IV: Diffraction

Fresnel’s diffraction – Diffraction at a circular aperture, straight edge – Fraunhofer diffraction at a single slit – Double slit – Diffraction pattern – Transmission grating with theory – Experimental determination of wavelength – Oblique incidence.

[EMPLOYABILITY]

Unit – V: Polarization and Fibre optics

Nicol prism – Nicol prism as an analyzer and polarizer – Huygen’s explanation of double refraction in Uniaxial crystal – Elliptically and circularly polarized light – Production and detection – quarter wave plate and half wave plate – Basic ideas of optical fibre – Numerical aperture – Stepped and graded index fibres – Fibre optic communication (Block diagram only).

Learning Outcomes:

Generate ray diagrams to predict the position and size of images in optical systems.

Understand and use the mathematical formulae to predict the position and size of images produced by simple lenses.

Measure the focal length of lenses and mirrors using various methods.

Understand the origin of spherical aberration in lenses.

Books for study:

- 1) Text Book of Optics – Brijlal and Subramaniam , S. Chand & Co.,
- 2) Optics by Khanna and Gulati.
- 3) Fibre Optic Communication systems – Subirkumarsarkar, S.Chand& Co.,

Sub. Code	Core Practical– IV Basic Electronics Lab	L	T	P	C
20113AEC44L		0	0	3	3

List of Experiments

- 1) CRO – Study of waveforms – Lissajous figures – determination.
- 2) Potentiometer – Temperature coefficient of resistance.
- 3) FET Characteristics.
- 4) Field along the axis of a coil – determination of magnetic moment.
- 5) Spectrometer – Grating – Minimum deviation method.
- 6) Potentiometer – EMF of a thermocouple.
- 7) Spectrometer - $i-i'$ curve.
- 8) Koenig's method – Uniform bending – Young's modulus.
- 9) Cauchy's Constant determination.
- 10) IC Regulated power supply.

Course Code	Allied Paper-II Inorganic, Organic and Physical Chemistry- II	L	T	P	C
20114AEC45		5	0	0	5

UNIT – I : Amino acids and proteins

Amino acids- Classification based on structure and essential and non - essential amino acids – preparation and properties – peptides – (elementary treatment) proteins – Classification, based on physical properties and functions. Structure of proteins – primary and secondary (elementary treatment)

UNIT – II: Coordination chemistry

Nomenclature of mononuclear complexes – Werner Sidgwick, and Pauling’s theories – Chelation and its industrial importance to EDTA. Biological role of hemoglobin and chlorophyll Metallic bond Electron gas, Pauling and band theories. Semiconductors intrinsic, n- type and p-type.

UNIT –III: Synthetic polymers:

Teflon, Alkyl and epoxy resins, poly esters – General treatment only. Heterocyclic compounds – Furan, Thiophene, pyrrole and pyridine – preparation and properties of pyridine and pyrrole – Quinoline and isoquinoline.

Stereoisomerism – lactic and tartaric acid – racemic mixture and resolution. Geometrical keto – enol tautomerism Meaning of E, Z, R, S, D, L, meso, (+), (-) in stereochemistry.

UNIT- IV : Electrochemistry:

Specific and equivalent conductivities – their determination – Oswald’s dilution law, Kohlrausch law. P_H and Buffer: Importance of pH and buffers in living systems – P_H determination by colorimetric and electrometric methods.

UNIT –V : Surface chemistry:

Emulsion, gels preparation, properties and applications. Electrophoresis, Chromatography – Column, paper and thin layer chromatography.

[ENTERPRENEURSHIP]

References:

1. S.S.Dara – A Text Book of Environmental chemistry and pollution control- Chand and Co.
2. D.N.Bajpai – Advanced physical chemistry – Chand and Co.
3. Bruce H.Mahan, University chemistry – Narosa publishers, New Delhi, 1989.
4. R.T.Morrison and R.N.Boyd, organic chemistry, 6th Edition.
5. I.L.Finar, organic chemistry, Volume I
6. R.D.Madan, Advanced Inorganic chemistry.
7. Puri and Sharma, Text book of Physical chemistry.

Course code	Allied-II Practical-II Volumetric Analysis Lab- II	L	T	P	C
20114AEC46L		0	0	3	2

I - A study of the reactions of the following organic compounds:

- a. Carbohydrate,
- b. Amide,
- c. Aldehyde,
- d. Ketone,
- e. Acid,
- f. Phenol.

The students may be trained to perform the specific reactions like tests for elements (nitrogen only) aliphatic or aromatic saturated or unsaturated and functional group present and record their observations.

II - Preparation (Single stage) involving

- a. Nitration,
- b. Hydrolysis
- c. Bromination.

Course Code	Skill Based Elective Package Lab -IV	L	T	P	C
20120SEC04AL			0	0	2

MS-ACCESS

1. Create a Database with a simple Table
2. Create a Database for Students Mark List using Queries.
3. Create a Database for the employees in an organization and sort by their date of joining.
4. Create Queries to Select Records that matches specific condition.
5. Create Relationships among the different Tables.
6. Create Queries using Built-in Functions.
7. Develop Forms to enter data in to the Student Marks Database
8. Develop Forms to enter data in to the Electricity bill Database.

Course Code	Skill based Elective -IV	L	T	P	C
20160SEC04B	Etiquette and Interviewing Skills	0	0	2	1

UNIT I

Corporate

Corporate grooming and dressing, Etiquettes in social as well as office settings, Email Etiquettes, Telephone Etiquettes, Contemporary issues in corporate life: diversity, Attrition, Work life balance, Hygiene and health.

UNIT II

Interviewing Skills

Researching the job-Researching the company -Questions to research the company- Informational interviews-Behavioral interviewing- Types of interview (Individual interviews, panel interviews, serial interviews, video interviews and teleconferencing) references-selling yourself-dressing for success-body language-stress reduction-Handling illegal questions.

Course Code	Communicative English-IV	L	T	P	C
20111SEC04L		0	0	1	1

Aim:

- To develop communicative skills

Objective:

- To use gerund and make sentences
- To change sentences from direct to indirect and vice versa
- To understand the listening skill
- To enhance reading skill
- To familiarize with the singular and plural forms
- To describe a picture

Outcome:

- Understand grammar
- Develop listening and reading skills

UNIT –I

Gerund

Infinitive

UNIT –II

Direct and Indirect

UNIT –III

Listening -types-features of a good listener-active and passive listening-effective listening

UNIT –IV

Reading-purpose-technique-types-reading rates-reading & interpretation

UNIT –V

Singular and Plural

Letter writing

[SKILL DEVELOPMENT]

References:-

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V.Martinet

-Wren and Martin

-Meenakshi Sharma &Sangeetha Sharma

Course Code	Environmental Studies	L	T	P	C
201ENVTSTU		1	0	0	1

Aim:

Provide MESM students the opportunity to formulate learning outcomes for their degree program through interaction with URI faculty and staff involved in the six different MESM advising tracks as well with URI faculty and staff working in environmental science and management.

Objectives

The fundamental objective of the course is to introduce new Master of Environmental Science and Management (MESM) students to the opportunities and structure of the degree program. Specifically, the course will:

UNIT-I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance - Need for public awareness - **Natural Resources: Renewable and Non-Renewable Resources**- Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources.

UNIT-II

Ecosystems- Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Types of ecosystem - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems.

UNIT-III

Biodiversity and its Conservation– Definition - Genetic, species and ecosystem diversity - Biogeographical classification of India - Values of biodiversity - Biodiversity at global, National and local levels - India as a mega - diversity nation - Hot-spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity.

UNIT-IV

Environmental Pollution– Definition - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Solid waste Management - Role of an individual in prevention of pollution - Disaster management.

[ENTERPRENEURSHIP]

UNIT-V

Social Issues and the Environment- From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics - Climate change green house effect and global warming - Ozone depletion - Waste land reclamation - Consumerism and waste products - Environmental Legislation - Issues involved in enforcement of environmental legislation - Public awareness - **Human Population and the Environment.**

Learning outcomes:

Provide MESM graduate students the opportunity to identify and develop professional internships (EVS 597) through interactions with professionals representing environmental agencies, nongovernmental organizations, or private firms.

TEXT BOOK:

1. "ENVIRONMENTAL STUDIES", K.Kumarasamy, A.Alagappa Moses, M.Vasanthi.

Course Code	Core Paper - V Electricity And Magnetism	L	T	P	C
20113AEC51		6	0	0	6

Aim:

To develop a basic understanding of electric and magnetic fields in free space using the integral forms of Maxwell's laws.

Objectives:

Describe the electric field and potential, and related concepts, for stationary charges. Calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential.

Unit – I: Electrostatics

Coulomb's law – electrical images – Electric intensity and potential due to an earthed conducting sphere, Different case, applying the principle of electrical images – Electrometers: quadrant electrometers.

Unit – II: Magnetic Properties of Materials

Definitions – IH and BH curves for a magnetic material, Magnetometer method, Ballistic galvanometer method – Hysteresis –coercivity –retentivity – loss of energy per cycle – Difference in the magnetic properties of iron and steel – Magnetic circuit – Magnetic circuit of an iron ring with small air gap.

Unit – III: Chemical effects of electric current

Faraday's law's of electrolysis – Ionic velocities and Mobilities – Calculation and experimental determination of ionic mobilities – Transport numbers.

Thermo electricity – Peltier coefficient – Thomson coefficient – Application of thermodynamics to a thermocouple and Relation between Peltier and Thomson coefficients – Thermo electric diagrams – Uses.

Unit – IV: LCR Circuits

Determination of Self inductance by Rayleigh method – DC circuits: Growth and decay of current in a circuit containing resistance and inductance – Growth and decay of charge in a circuit containing resistance and capacitor – Application of electromagnetic induction – Flux meter.

[EMPLOYABILITY]

Unit – V:

AC Bridges: Owen's bridge – Anderson's bridge – Electromagnetic theory – Maxwell's equations – derivation – Propagation of energy – poynting vector.

Learning Outcomes:

Describe the magnetic field for steady currents and moving charges.

Calculate magnetic properties of simple current distributions using Biot-Savart and Ampere's laws.

Describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws.

Describe the basic physical content of Maxwell's laws in integral form.

Books for Reference:

- 1) Electricity and Magnetism – Brijlal & Subramaniam.
- 2) A text book of Electricity & Magnetism – K.K. Tiwal

Course Code	Core Paper - VI Atomic Physics	L	T	P	C
20113AEC52		6	1	0	6

Aim:

This course will introduce students to the fundamentals of atomic physics and rudimentary nuclear physics. It aims to provide a coherent and concise coverage of traditional atomic and physics.

Objectives:

Important topics of current research interest will be also discussed, such as laser cooling and trapping which plays an important role in the realization of Bose-Einstein condensate in atomic vapors.

Unit – I: Positive ray analysis

Properties – e/m of positive rays: Thomson’s parabola method – Aston and Bain bridges – Determination of critical potential – Franck and Hertz’s experiment.

Unit – II: Photo Electricity

Photo electric emission – laws – Lenard’s experiment – Richardson and Compton experiments – Einstein’s photoelectric equation – Experimental verification of Einstein’s photoelectric equation by Millikan’s experiment.

Unit – III: Vector atom model

Various quantum numbers, L-S and j-j couplings – Pauli’s exclusion principle – electronic configuration of elements and periodic classification – Magnetic dipole moment of electron due to orbital and spin motion – Bohr magneton Stern and Gerlach experiment.

[EMPLOYABILITY]

Unit – IV: Fine structure of special Lines

Special terms and notations – Selection rules – Intensity rule and interval rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra.

Spectrum of Helium – Zeeman effect – Larmor’s theorem – Debyes quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – (Qualitative study Only).

Unit – V: X – Rays:

X – Rays – Bragg’s law – Bragg’s, X-Ray spectrometer – Origin and analysis of continuous X – ray spectrum and characteristic X – ray spectrum – Moseley’s law and its importance – Compton effect – derivation of expression for change in wavelength – its experimental verification.

[EMPLOYABILITY]

Learning Outcomes:

Explain how light interacting with atom; the working principle of laser trapping and cooling
Recognize the general features of atomic/nuclear spectroscopy

Books for Reference:

- 1) Modern Physics by R. Murugeshan.
- 2) Modern Physics by J.B. Rajam
- 3) Atomic and Nuclear Physics – N. Subramaniam and Brijlal.

Course Code	Core Paper - VII Basic Electronics	L	T	P	C
20113AEC53		5	0	0	5

Aim:

Electronic systems are built with components like resistance, capacitance, diodes, Transistors, etc. The intention of the course is to create awareness about the principle and

Objectives:

Working of the commonly used components in electronic systems. Upon completion of the Course the student is expected to be able to identify, use and check various electronic components.

Unit – I: Semiconductors

Introduction – Pure semiconductor – Impurity semiconductor – Fermi level in semiconductor – Hall effect – Junction diodes – PN Junction – Biased PN Junction – Volt Ampere characteristic of a PN Junction – Zener diode – Tunnel diode.

Unit – II: Transistors

Junction Transistor – Transistor construction – Modes of operation of a transistor – α and β of a transistor – Relation – static characteristic in CB and CE modes – Transistor amplifier – Transistor Biasing.

[EMPLOYABILITY]

Unit – III: Special Semiconductor Devices

Field effect transistor – FET parameters – Comparison between FET and Transistor – SCR – UJT.

Unit – IV: Amplifiers

Voltage and Power amplifiers: R-C coupled Transistor amplifier – Power amplifier – Class A, Class B and Class C power amplifier – Push pull amplifier – Effect of negative feedback.

Unit – V: Oscillators

Types of Oscillators – Concept of feedback oscillator – Hartley – Colpitts - Phase shift oscillator – Tuned collector oscillator – Wien-Bridge oscillator.

[EMPLOYABILITY]

Learning Outcomes:

Students will be able to explain basic circuit concepts and responses.

Will be able to do linear modeling of passive elements and sources.

Will be able to use analytical techniques in resistive circuits energized by direct current voltage and current sources.

Books for Reference:

- 1) Principles of Electronics – V.K. Metha
- 2) A text book of Applied Electronics – R.S. Sedha

Course Code	Core Practical – V	L	T	P	C
20113AEC54L	Digital Electronics Lab	0	0	3	3

List of Experiments

- 1) M and H – Absolute determination using deflection and vibration magnetometer.
- 2) Zener regulated power supply – percentage of Regulation.
- 3) Logic gates, IC- Version.
- 4) Universality of NOR gates.
- 5) Verification of Logical Expressions
- 6) Hartley oscillator – Transistor.
- 7) Universality of NAND gates.
- 8) Operational Amplifier – Adder and Subtractor.
- 9) 8-bit addition and subtraction using microprocessor 8085.
- 10) 8-bit multiplication and division using microprocessor 8085.

Course Code	Discipline Specific Elective -I	L	T	P	C
20113DSC55A	Energy Physics	5	0	0	4

Aim:

To understand the physical background and mechanisms associated with power generation and related issues.

Objectives:

Understand the forms of energy, its production, transport and storage

Understand basic nuclear physics and interactions with matter

Unit – I: Non- Renewable energy sources

World Energy Futures – Energy Sources and their Availability – Coal – Oil – Natural gas – merits and demerits.

[EMPLOYABILITY]

Unit – II: Renewable Energy Sources

Solar energy – nature of solar radiation – solar constant – Determination of Solar constant – Solar water heaters – Solar cooling – Solar ponds – Solar cookers – Water desalination.

Unit – III: Other renewable energy sources

Bio mass energy – gobar gas plants – geothermal energy – wind energy – Wind mill – Types of Wind mills – ocean thermal energy conversion (OTEC) – Energy from waves and tides.

[EMPLOYABILITY]

Unit – IV: Energy Storage

Energy storage systems – Mechanical Energy storage – Compressed Air storage – Electrical storage – Thermal energy storage.

Unit – V: Impacts of Non-conventional energy

Energy consumption in domestic, Industrial- Transportation and Agricultural sectors – Energy options for the developing countries – Impacts due to non conventional energy sources – global warming. and its impacts.

[EMPLOYABILITY]

Learning Outcomes:

Understand the conditions necessary for sustainable chain reactions in fissile material

Understand the design criteria for the control of a nuclear reactor

Understand the principles of nuclear fusion useful in power generation and stellar fusion

Understand physical ideas and issues associated with renewable forms of energy

Books for Reference:

- 1) Solar energy utilization – G.D. Rai.
- 2) Solar energy – S.P. Sukhatme

Course Code	Title	L	T	P	C
20113DSC56B	POLYMER SCIENCE	5	0	0	3

UNIT I - Properties of an isolated polymer molecule.

Ideal chain
 Segmental distribution
 Non-ideal chains
 Scaling laws

UNIT II - Concentrated solutions and melts

Thermodynamics of polymer solutions
 Concentration fluctuations in polymer solutions
 Blends
 Block copolymers

UNIT III - Polymer gels.

Elasticity
 The stress optical law
 Interactions between partial chains
 Swelling of gels

UNIT IV - Molecular motion of polymers in dilute solution.

Brownian motion
 Bead-spring model
 Dynamic light scattering

UNIT V - Molecular motion in entangled polymer systems.

Dynamics of concentration fluctuations
 Reptation
 Viscoelasticity of polymers

[EMPLOYABILITY]

Reference Books:

- 1) "Introduction to Polymer Physics" M. Doi, Clarendon Press 1996.
- 2) "Scaling concepts in polymer physics" P. G. de Gennes 1979.
- 3) "The theory of polymer dynamics" Oxford University Press, 1986.
- 4) "Principles of polymer chemistry." P. J. Flory, 1953.

Course Code	Title	L	T	P	C
20113DSC56C	SOLAR ENERGY FOR ENVIRONMENT	5	0	0	3

UNIT-I – Solar Radiation:

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

UNIT-II – Solar Thermal Systems:

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III – Solar Photovoltaic Systems:

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

UNIT IV – Experimental I

1. Plot sun chart and locate the sun at your location for a given time of the day.
2. Analyse shadow effect on incident solar radiation and find out contributors.
3. Connect solar panels in series & parallel and measure voltage and current.
4. Measure intensity of solar radiation using Pyranometer and radiometers.

[EMPLOYABILITY]

UNIT V – Experimental II

5. Construct a solar lantern using Solar PV panel (15W)
6. Assemble solar cooker
7. Designing and constructing photovoltaic system for a domestic house requiring 5kVA power
8. Assignments/Model Exam.

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
2. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata McGraw Hill Publishers, 1999.
3. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

Course Code	Title	L	T	P	C
20113DSC56D	SEMICONDUCTOR PHYSICAL SCIENCE	5	0	0	3

UNIT – I Semiconductors:

Energy Band and Charge Carriers: Energy bands in semiconductors, Types of semiconductors, Charge carriers, Intrinsic and extrinsic materials. Carrier concentration: Fermi Level, Electron and hole concentration equilibrium, Temperature dependence of carrier concentration, Compensation and charge neutrality. Conductivity and mobility, Effect of temperature, Doping and high electric field.

UNIT – II Optical Excitation in Semiconductor:

Optical absorption, carrier generation, Carrier life time, diffusion length and photo conductivity, Direct and indirect recombination and trapping, Photoconductive devices. Diffusion of carriers, Einstein relation, Continuity equation, Carrier injection, Diffusion length. Haynes-Shockley experiment.

UNIT – III Junctions:

p-n junction and contact potential, Fermi levels, Space charge, Reverse and Forward bias, Zener and Avalanche breakdown. Capacitance of p-n junction, Schottky barriers; Schottky barrier height, C-V characteristics, current flow across Schottky barrier: thermionic emission, Rectifying contact and Ohmic contact.

UNIT IV Field Effect Transistors:

JEFT amplifying and switching, Pinch off and saturation, Gate control, I-V characteristics. MOSFET, Operation, MOS capacitor, Debye screening length, Effect of real surfaces; Work function difference, Interface charge, Threshold voltage and its control, MOS C-V analysis and time dependent capacitance. Output and transfer characteristics of MOSFET.

UNIT V Photonics:

LED: Radiative transition, Emission spectra, Luminous efficiency and LED materials, Solar cell and photodetectors: Ideal conversion efficiency, Fill factor, Equivalent circuit, Voc, Isc and Load resistance, Spectral response. Reverse saturation current in photodetector.

[EMPLOYABILITY]

Recommended Books

1. Streetman, B. and Banerjee, S., Solid State Electronics, Prentice Hall India, (2006).
2. Sze, S.M., Physics of Semiconductor Devices, John Wiley, (1981).

Course Code	Title	L	T	P	C
20113DSC56E	ELECTRICAL AND NETWORK SKILLS	5	0	0	3

UNIT - I

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

UNIT – II

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

UNIT – III

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

UNIT – IV

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

UNIT – V

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure

current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board.

[EMPLOYABILITY]

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand & Co.
- A text book of Electrical Technology - A K Theraja
- Performance and design of AC machines - M G Say ELBS Edn.

Course Code	Skill Based Elective Package Lab -V	L	T	P	C
20120SEC05AL			0	0	2

PHOTOSHOP

1. Design a Visiting card with Background Image.
2. Design an Identity card with Photo.
3. Design a Letter pad with LOGO.
4. Create an Advertisement in a News paper for a Shop.
5. Design a Calendar with Pictures.
6. Design a Magazine using different type of Tools.
7. Create a Photoshop image using Lasso Tool.
8. Design a CD Cover.

Course Code	Skill based Elective -V	L	T	P	C
20160SEC05B	Leadership Skills and Body Language	0	0	2	1

UNIT I

Leadership Skills

Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, decision making, giving support, Vision, Mission, Coaching, Mentoring and counseling, Appraisals and feedback, conflict, Power and Politic, Organizing and conducting meetings, Public Speaking

UNIT II

Body language

Handshake: Type of Handshake - Posture- Universal Facial Gestures- Eye Contact- Nervous Ticks-reading and analyzing body language, Body language signals and meanings -eyes, mouth, head , arms , hands , handshakes , legs and feet, personal space

Course Code	Communicative English-V	L	T	P	C
20111SEC05L		0	0	2	1

Aim:

- To develop communicative skills

Objective:

- To develop vocabulary
- To comprehend meaning from context
- To involve in a dialogue
- To note the important points from the text.
- To write a letter
- To understand the subject verb agreement
- To teach the different genders

Outcome:

- Develop communicative skills

UNIT –I

Correct the spelling mistakes

Comprehension

UNIT –II

Find the odd one out

Picture description

UNIT –III

Abbreviations

Note making

UNIT –IV

Gender

Dialogue writing

[SKILL DEVELOPMENT]

UNIT –V

Acronyms

Concord

References:-

A Practical English Grammar

English Grammar

English Grammar and Composition

Technical Communication

-A.J Thomson and A.V.Martinet

-Wren and Martin

-Radhakrishna Pillai

-Meenakshi Sharma &Sangeetha Sharma

Course Code	Core Paper - VIII Digital Electronics And Microprocessors	L	T	P	C
20113AEC61		6	1	0	6

Aim:

To achieve a basic understanding of logic systems and to use this understanding in simple circuit designs.

Objectives:

To show familiarity with basic logic gates, Boolean algebra and binary numbers.

To understand how particular logical functions may be implemented and to design systems

To implement simple truth tables.

To understand how binary addition may be implemented using logic gates.

Unit – I: Number systems and codes

Decimal, Binary, Octal and Hexa decimal systems – Conversion from one to another – Binary addition, subtraction, multiplication, division, complements – Codes: BCD, Weighted, excess three, Gray code.

Unit – II: Boolean Algebra

Fundamental concepts of Boolean algebra – Basic gates and universal gates – De Morgan’s theorem: Simplification of expressions – Karnaugh map, Sop - Pas.

Unit – III: Logic Design

Half adder – Full adder, Subtractors, Multiplexers, Demultiplexer, Flip-Flops: R-S Flip Flops, J-K Flip Flop, D-Flip Flop, T-Flip Flop, Master Slave – Shift Registers – Counters – BCD – Up - Down.

Unit – IV: Memory elements

Memory cell - RAM – types – ROM: ROM, PROM, EPROM, EEPROM – Magnetic Disk Memories – Magnetic tapes – Compact disc.

Unit – V: Micro processor

Organization of 8085 – working – Machine language – Assembly language – Addressing mode, Instruction set – Programming for 8 – bit addition , subtraction, Finding a Largest number in an array – Finding a smallest number in an array.

[EMPLOYABILITY]

Learning Outcomes:

understand latches and simple memory devices.

appreciate the progression from latches to flip-flops and understand the operation of the J-K flip-flop.

be able to use and predict the behaviour of simple circuits involving J-K flip-flops.

understand excitation tables and be able to use them to design simple cyclic circuits.

Books for Reference:

- 1) Digital Principles and application – Albert Paul Malvino and Donald Leach.
- 2) Digital Design – M. Morris Mano.
- 3) Fundamentals of Microprocessors and Microcomputers – B.Ram.

Course Code	Core Paper - IX Wave Mechanics And Nuclear Physics	L	T	P	C
20113AEC62		6	1	0	6

Aim:

To explore the detailed behaviour of vibrating systems and wave motion in many different physical systems.

Objectives:

Demonstrate understanding of the behaviour of oscillating systems and wave motion.

Unit – I: Duality

Planck's hypothesis, Planck's theory and black body radiation – confirmation of quantum of energy – Compton effect and photoelectric effect – De Broglie waves – Phase and group velocities – Davison-Germer experiment – G.P Thomson experiment.

Unit – II:

Postulates, Observables, Operators, wave packets – Probability density – Physical significance of the wave function – continuity equation – expectation values – Box normalisation – Schrodinger's time independent and time dependent wave equations.

Unit – III:

Uncertainty principle, two applications – Grating and Gamma ray experiment – step potential – square well potential – L.H.O – Tunneling effect – particle in a box.

[EMPLOYABILITY]

Unit – IV: Nucleus

Review of basic properties of nuclei – mass, radius, binding energy, packing fractions, nuclear moments – isotopes – isobars – radioactivity – Linear accelerator - Cyclotron – Betatron – Geiger Muller counter – Cloud chamber – Photographic emulsions – Q value of nuclear reaction – discovery of neutron – Exp.- reactions.

Unit – V:

Liquid drop model – application to fission, fission fragments, neutrons in fission process – nuclear energy – nuclear chain reactions - thermonuclear reactor – neutron life cycle – atom bomb.

Shell model – magic numbers – spin orbit coupling – application to islands of isomerism and nuclear moments – Basic ideas of a nuclear reactor.

[EMPLOYABILITY]

Learning Outcomes:

Use the mathematical formalism that describes them.

Recognize examples across many areas of physics.

Books for Reference:

- 1) Modern Physics – Brijlal and Subramanian.
- 2) Modern Physics – R. Murugasan.
- 3) Nuclear Physics – D.C. Tayal.
- 4) Introduction to Modern Physics – F.K. Richmyer.
- 5) Nuclear Physics – I. Kaplan.

Course Code	Core Practical – VI	L	T	P	C
20113AEC63L	Advanced Digital Electronics Lab	0	0	3	3

List of Experiments

- 1) LCR Circuit – Series and Parallel.
- 2) Half adder and Half Subtractor.
- 3) Verification of DeMorgan's Theorems.
- 4) Single stage RC Coupled amplifier – Transistor.
- 5) Astablemultivibrator.
- 6) FET amplifier.
- 7) Full adder.
- 8) Conversion from decimal to hexadecimal system using microprocessor 8085.
- 9) 16 – bit addition using microprocessor 8085.
- 10) Timer Using 555 IC.

Course Code	Discipline Specific Elective -II Material Physics	L	T	P	C
20113DSC64A		5	0	0	4

Aim

The subject-specific aims of a degree in materials science are to understand the structure, properties, processing and performance of the principal classes of materials, and to understand and exploit the relationships between these four aspects of materials.

Objectives:

To understand the design, selection and processing of materials for a wide range of applications in engineering and elsewhere.

Unit – I: Crystallographic fundamentals

Crystal lattice – Primitive and Unit cell – Seven classes of crystals – Bravais lattice – Miller Indices – Structure of crystals – Simple cubic, Hexagonal close packed structure, Face centered cubic structure, Body centered cubic structure – Sodium chloride structure – Zinc Blende structure – Diamond Structure.

[EMPLOYABILITY]

Unit – II: Crystallography

Diffraction of X-Rays by Crystals – Bragg's law in one dimension – Experimental method in X-Ray diffraction – Laue method, Rotating crystal method – Powder Photograph method – Laue's equations.

Unit – III: Magnetism

Different types of magnetic materials – Classical theory of diamagnetism (Langevin's Theory) – Langevin's theory of paramagnetism – Weiss theory of paramagnetism – Qualitative explanation of Heisenberg's interpretation of internal field and quantum theory of ferromagnetism.

[EMPLOYABILITY]

Unit – IV: Dielectrics

Fundamental Definitions – Dielectrics – Different types of electric polarization – Frequency and Temperature effects on polarization – Dielectric loss – Local field on internal field – Clausius–Mossotti Relation – Determination of Dielectric constant.

Unit – V : Modern materials and new materials

Polymers – Ceramics – Super strong materials – Cermets – Electrets – Metallic glasses – Optical materials – Acoustic materials – Bio materials – Nuclear materials.

[SKILL DEVELOPMENT]

LearningOutcomes:

To understand how and why the properties of materials are controlled by structure and bonding at the atomic-scale, and by features at the microstructural and macroscopic levels. To understand how and why the structure and composition of a material may be controlled by processing.

Books for Study:

Material Science – M. Arumugam.

Course Code	Title	L	T	P	C
20113DSC65B	PARTICLE PHYSICS	5	0	0	3

UNIT I Introduction:

Fermions and bosons, Particles and antiparticles, Quarks and leptons, Yukawa picture, Types of fundamental interactions - electromagnetic, weak, strong and gravitational, HEP Units, Bound states of quarks, Hadron, Mesons and Baryons.

UNIT II Invariance Principles and Conservation Laws:

Interactions and fields in particle physics, Classical and quantum pictures Invariance in classical mechanics and in quantum mechanics types of symmetries and their breaking, Parity, Pion parity, Charge conjugation, Time reversal invariance, CP violation, CPT theorem.

UNIT III Hadron-Hadron Interactions:

Cross section and decay rates, Pion spin, Isospin, Two-nucleon system, Pion-nucleon system, Strangeness and Isospin, and Hypercharge.

UNIT IV Static Quark model of Hadrons:

The Eightfold way, Meson nonet, Baryon octet, Baryon Decuplet, hypothesis of quarks, SU (3) symmetry, Quark spin and color, Quark-antiquark combinations.

UNIT V Weak Interactions:

Classification of weak interactions, Fermi theory, Parity non-conservation in β -decay, Helicity of neutrino, Experimental verification of parity violation.

[SKILL DEVELOPMENT]

Recommended Books

1. Perkins, D.H., Introduction to High Energy Physics, Cambridge University Press, (2000).
2. Hughes, I.S., Elementary Particles, Cambridge University Press, (1991).
3. Close, F.E., Introduction to Quarks and Partons, Academic Press, (1979).
4. Segre, E., Nuclei and Particles, Benjamin-Cummings, (1977).
5. Khanna, M.P., Introduction to Particle Physics, Prentice-Hall of India, (2004).

Course Code	Title	L	T	P	C
20113DSC65C	Photovoltaics for Energy Conversion	5	0	0	3

AIM

The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

UNIT I Generation and recombination of electron-hole pairs:

Bandgap-to-bandgap processes, Shockley–Read–Hall recombination, Auger recombination, Surface recombination, Carrier concentration in non-equilibrium; Semiconductor junctions: p-n homojunctions, Heterojunctions, Metal-semiconductor junctions

UNIT II Solar cell parameters and equivalent circuit:

External solar cell parameters, external quantum efficiency, the equivalent circuit.

UNIT III Losses and efficiency limits:

The thermodynamic limit, The Shockley-Queisser limit, additional losses, Design rules for solar cells.

UNIT IV Crystalline silicon solar cells:

Crystalline silicon, Production of silicon wafers, Designing c-Si solar cells, fabricating c-Si solar cells, High-efficiency concepts;

UNIT V Thin-film solar cells:

Transparent conducting oxides, The III-V PV technology, Thin-film silicon technology; Chalcogenide solar cells, Organic photovoltaics, Hybrid organic- inorganic solar cells; Plasma-enhanced chemical vapour deposition, Physical vapour deposition, Screen printing technology, Electroplating technology;

[SKILL DEVELOPMENT]

References:

1. Arno Smets, Klaus Jäger, Olindo Isabella, Miro Zeman, René van Swaaij, “Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems”, UIT Cambridge, 2016.
2. Xiaodong Wang, Zhiming M. Wang (Editors), Springer Series in Materials Science-Volume 190, “High-Efficiency Solar Cells: Physics, Materials, and Devices”.
3. Jenny Nelson, “The Physics of Solar Cells” Imperial College Press, 2003.

Course Code	Title	L	T	P	C
20113DSC65D	PHYSICS OF RADIOGRAPHY	5	0	0	3

Aim:

The material in this section is designed to teach the basics of radiological physics, interaction of radiation with matter, basic dosimetric concepts and radiation detectors.

Unit1: Ionizing & Non ionizing Radiation

Electromagnetic spectrum- Different sources of Non Ionizing radiation-Radiofrequency, Microwaves, Infrared, Visible and Ultra violet radiation production, physical properties and their interaction with tissues. Radiation quantities and units - Radiometry - particle flux and fluence - energy flux and fluence -Linear and mass attenuation coefficients – Mass energy transfer and mass energy absorption coefficients

[SKILL DEVELOPMENT]

Unit 2: X-Ray Generators

Discovery- Production – Properties of X-rays – Characteristics and continuous spectra– Design of hot cathode X-ray tube – Basic requirements of medical diagnostics, therapeutic and industrial radiographic tubes – Rotating anode tubes – Hooded anode tubes – Industrial X-ray tubes - Safety devices in X-ray tubes –X ray tubes for crystallography.

Unit 3: Particle Accelerators

Particle accelerators for industrial, medical and research application – The Resonant transformer – Cascade generator – Van De Graff Generator – Pelletron – Cyclotron – Betatron Synchro-Cyclotron – Linear Accelerator – Klystron and magnetron –Travelling and Standing Wave Accelerations – Microtron – Electron Synchrotron –Proton synchrotron.

Unit 4: Interaction of photons with Matter

Interaction of electromagnetic radiation with matter- Photoelectric and Compton process and energy absorption – Pair production – Attenuation and mass energy absorption coefficients – Relative importance of various processes.

Unit 5: Interaction of charged particles with Matter

Classical theory of inelastic collisions with atomic electrons- Energy loss per ion pair by primary and secondary ionization –Dependence of collision energy losses on the physical and chemical state of the absorber - Cerenkov radiation – Electron absorption process – Scattering Excitation and Ionization –Radiative collision - Bremstrahlung – Range energy relation - Continuous slowing down approximation(CSDA) – transmission and depth dependence methods for determination of particle penetration – empirical relation between range and energy

Books for Reference:

1. Faiz M. Khan, The Physics of Radiation therapy, Lippincott Williams & Wikins, Philadelphia, 3rd edition, 2003.
2. W.R. Hendee, Medical Radiation Physics, Year Book Medical Publishers Inc., London,2003.
3. R. E. Lapp, Nuclear Radiation Physics (Prentice-Hall Inc., New York, 2048).
4. L. Slack and K. Way, Radiations from Radioactive Atoms in frequent use,(United States Government Printing Office, Washington, 2059).
5. K. S. Krane, Introductory Nuclear Physics (John-Wiley, New York 2087).

Course Code	Title	L	T	P	C
20113DSC65E	PHOTONICS	5	0	0	3

Aim:

- To learn the basic principles and working of lasers, basic processes and features of nonlinear optical materials and fiber optics.

UNIT – I: SOLID STATE LASERS

Solid state crystalline and glass Lasers – Advantages – Construction of the Ruby Laser – Mechanism of Excitation of the Ruby Laser – Neodymium Lasers – Nd-YAG Laser Nd-glass Laser – Alexandrite Laser – Fiber Glass Laser – Solid state Tunable Laser – Titanium Sapphire Laser – Colour center Lasers – DPSSL.

UNIT – II: LIQUID AND DYE LASERS

Geometry of Dye lasers – Pulsed Dye lasers pumped by Flash lamps – Tunable pulsed lasers pumped by other lasers – Tunable continuous Wave Dye lasers – Mode-locked Ring Dye lasers – Mechanism of Excitation of Mode – locked Ring Dye laser – Helium-neon Laser – Argon Iron Laser – Krypton Ion laser – Metal Vapour lasers – Carbon Dioxide Laser – Gas Dynamic Laser – Nitrogen Laser.

UNIT – III: CHEMICAL, X-RAY AND FREE ELECTRON LASERS

Hydrogen chloride laser – Hydrogen fluoride laser – X-ray lasers – Free Electron Lasers (FEL) – Characteristics of semiconductors lasers – Semiconductor diode lasers – Heterojunction semiconductors materials – Double Hetero structure Laser – Quantum – well Lasers – Higher power Semiconductor Diode Lasers – Single Mode Lasers – Multimode Lasers – Surface – Emitting Lasers (SELS).

UNIT – IV: Industrial Applications of Lasers (Material Processing)

High Power Gas Lasers – Material Processing with Lasers – Metals and Lasers Interactions – Materials Processing mechanism – Hole Drilling with Lasers – Cutting Process with Lasers - Laser Welding – The Welding Process – Micro Laser Welding – Deep Penetration Welding (High Power Laser Welding) Laser Hardening – Marking with Lasers – Wire Striping with laser – Lasers in Nuclear Science – Isotope Separation – Lasers in Spectroscopy – Lasers in Chemistry – Light Detecting and Ranging (LIDAR).

UNIT – V: Laser Communication / Holography and Its Applications / Medical Science

Optical Sources for fiber optical communication – Photo (or photon) Detectors – Operation of Optical Receivers – Essential Characteristics of Laser in Fiber Optic Communication – Types of Holograms – Intensity Distribution in a Hologram – Fourier Hologram – Thick Hologram – Colour Holograms – Computer Holograms – Holographic Microscopy & Applications – Laser Diagnostics – Photo medicine – Lasers in Ophthalmology – Lasers for General Surgery – Lasers In Dermatology – Cardiology – Lasers In Dermatology – Cardiology – Lasers In Density – Lasers Used in Medicine.

[SKILL DEVELOPMENT]

Books for Study:

1. Koechner. W. Solid State laser engineering (Springer – Verlag, New York, 2092).
2. Svelto, O. Principles of Lasers (Plenum Press, New York, 2076).
3. Schafer F.P. Dye Lasers (Springer – Verlag, Berlin, 2073).
4. Rampal, V.V. Lasers and Applications (South Asian Publishers, New Delhi, 2093).

Course Code	General Elective Journalism	L	T	P	C
20111GEC		4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub Editor

[SKILL DEVELOPMENT]

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

References:-

- | | |
|---------------------------------|--------------------------------------|
| Journalism | -Susan |
| Professional Journalism | - John Hogenberg |
| News Writing and Reporting | - M.James Neal (Surjeet Publication) |
| Professional Journalism | -M.V Komath |
| The Journalist’s Handbook | -M.V Komath |
| Mass Communication & Journalism | - D.S Mehta |

Course code	General Elective	L	T	P	C
20112GEC	Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

KantiSwarup, P.K.Gupta and Manmohan, “Operations Research”

Course Code	General Elective Food And Adulteration	L	T	P	C
20114GEC		4	0	0	2

Aim: To introduce students to food safety and standardization act and quality control of foods.

Objectives:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislative aspects of adulteration.
3. To educate about standards and composition of foods and role of consumer.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

[ENTREPRENEURSHIP]

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	General Elective Mushroom Technology	L	T	P	C
20120GEC			4	0	0

UNIT-1

Introduction-history-scope of edible mushroom cultivation-types of edible mushroom in India-calacybleindica, volvariellavolvacea ,pleurotus sp. Agaricusbisporus

UNIT-II

Pure culture-preparation of media(PDA and oat meal agar media)sterilization-preparation of test tube slants to store mother culture-culturing of pleurotus mycelium on petriplates-preparation of mother spawn in saline bottle and polypropylene bags and their multiplication

UNIT-III

Cultivation technology:infrastructure,substrates(locally available)polythene bag,vessels,inoculation hood-inoculation loop-low cost stove-sieves-culture rack mushroom unit(Thatched mouse)-mushroom bed preparation-paddy straw,sugarcane trash,maizastraw,banana leaves

UNIT-IV

Storage and nutrition:short term storage-long term storage (Scanning,pickles, papads,drying,storage ion salt solutions)-nutrition:proteins,aminoacids,mineral elements,nutrition:carbohydrates-crude fiber content,vitamins

UNIT-V

Food preparation, types of foods prepared from mushroom-soup,cutlet,omelette,samosa,pickles,curry,researchcentres-national level and regional level cost benefit ratio-marketing in India and abroad-export value

REFERENCES:

- 1.Marimuthu et al.,(1991) oyster mushrooms,Dept of plant pathology, TNAU,coimbatore
- 2.Nita Bahl(1988) Hand book of mushrooms.IIedition.Vol.1&II
- 3.Paul stamets,J.S and Chilton,J.S.(2004).Mushroom cultivator:A practical guide to growing mushrooms at home.Agarikon press
- 4.Shu-Ting chang,PhilipG.Miles,Chang,S.T(2004) Mushrooms: cultivation,nutritionalvalue,medicinal effect and environmental impact,2 nd ,CRC press.
- 5.Swaminathan M.(1990) food nutrition,bappco.Thebanglore printing and publishing co Ltd.,Banglore.

Course Code	General Elective	L	T	P	C
20120GEC	Web Technology	4	0	0	2

Aim:

- To equip the students with basic programming skill in Web Designing

Objective:

- To understand and practice mark up languages
- To learn Style Sheet and Frames

Outcomes:

- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages

UNIT I

Introduction to the Internet – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms.

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

Reference Book

Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
20122GEC	E-Commerce and its Application	4	0	0	2

Aim:

To organize and promote the exchange of information on communication protocols and information exchange mechanisms for Electronic Commerce.

Objectives:

To be aware of all aspects of communication and information exchange in Electronic Commerce, including:

- Navigation, brokerage, advertising, and catalogue exchange in pre-sales activities.
- Negotiation and contract making protocols in interactions between consumers, businesses, and public administration.
- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government.

UNIT-I:

History of E-commerce and Indian Business Context: Early Business Information Interchange Effort - Emergence of the Internet-Emergence of the world wide web – The milestones – Advantages of E-Commerce- Disadvantages of E-commerce-Online Extension of a BAM model- Transition to E-commerce in India- The internet and India TELCO-Managing Supply chain on the Internet- Hindustan Lever – Getting the E-advantage – Asian paints – E-transforming the organization - CRISIL – Cost – Effective distribution channels – ICICI Bank – Comprehensive Transactions – E-transition challenges for Indian Corporate – The Information Technology Act,2000 – ITC’S echoupal

Business Models for E-Commerce: E-business models based on the Relationship of Transaction parties- E-business model base on the relationship of transaction types.

UNIT-II:

Enabling Technologies of the World Wide Web: Internet client – Server Application – Networks and Internets –Software agents – Internet Service Provider – Broadband Technologies – Hypertext –Java Script - XML

UNIT- III:

E-Marketing: Traditional Marketing – Identifying web presence Goals –The Browsing Behaviour model – online marketing – E-advertising – Internet Marketing Trends – Target Markets – E-branding – Marketing strategies – The Times of India.

UNIT-IV:

E-Security: Information system security-security on the Internet-E-Business risk Management issues-Information security environment in India.

UNIT-V

E-payment Systems: E-Banking at ICICI bank-Main concerns in internet banking-History's lesson about payments: People drive change-digital payment requirements-digital token-based E-payment systems-classification of new payment system-properties of electronic cash(E-cash)-check payment system on the Internet-risk and E-payment system-Designing E-payment system-digital signature-online financial service in India-online stock trading: The high speed alternative.

Outcomes:

- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government

Reference Book:

“E-Commerce: An Indian Perspective” P.T.Joseph, S.J. Third Edition

Course Code	General Elective	L	T	P	C
20161GEC	Indirect Taxes	4	0	0	2

Aim:

- To acquaint with the knowledge of indirect taxes

Objectives:

- To make the students to gain expert knowledge in indirect taxes.
- To have practical knowledge on excise duties and customs duties.
- To learn the fundamentals of service tax, sales tax and VATS.

Outcome

- Students gained knowledge of various provisions of central excise customs law, service tax, VAT and sales tax and their applications in different circumstance.

UNIT – I

Objectives of Taxation - contribution to Government revenue- cannons of Taxation – Tax system in India – Direct and Indirect taxes Advantages and Disadvantages of Indirect taxes.

UNIT – II

Central Excise Duty – Meaning - Levy and collection - Distinction between Excise duty and Customs Duty and Sales Tax. Types of excise duties Methods of Levying Excise Duty – Excise and small scale Industries – Excise and Exports.

UNIT – III

Customs Duty – Levy and collection of customs duty Different types of customs Duties – Prohibition on importation and exportation of goods. Exemptions from customs duty.

UNIT – IV

Service Tax – Growth of Service sector – Meaning of Service Tax – Elements of Service Tax- exempted services from tax - Value of taxable services-Different services on which tax is payable.

UNIT – V

Value Added Tax (VAT)

Meaning of VAT, Justification of VAT – VAT and Sales Tax Advantages and Disadvantages of VAT. Methods of Calculating VAT Levy of VAT and Types of VAT.

Reference Books:

- Income Tax Law and Practice - N.Hariharan.
- Business Taxation – T.S.Reddy/Hari Prasad Reddy.

Course Code	Skill Based Elective	L	T	P	C
20120SEC06AL	Package Lab -V I	0	0	2	1

FLASH

1. Drawing and painting original art by using simple objects in flash.
2. Develop a Flash Document by applying different type of Styles in Text with Animations.
3. Create a frame-by-frame animation technique.
4. Develop a program for animation with motion Tweening.
5. Develop a program for animation with shape Tweening.
6. Develop a program for adding sound to your movies.
7. Create a simple Banner.
8. Create a simple animation by using MovieClip and Graphic Symbols.

Course Code	Skill based Elective -VI	L	T	P	C
20160SEC06B	Life Skills and other Skills	0	0	2	1

UNIT I

Life Skills

Knows how to use technology to communicate safely and effectively. - Knows how to access community resources in case of emergency. -Knows how to obtain copies of personal documents - knows how to book train ticket, Bus Ticket and Air Ticket - Occupational Safety , First-aid

UNIT II

Other Skills

Meditation. Improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity.

Course Code	Communicative English-VI	L	T	P	C
20111SEC06L		0	0	2	1

Aim:

- To develop communicative skills

Objective:

- To extract the main ideas from a text
- To understand the meaning of text
- To expand an idea
- To shorten a text
- To develop vocabulary
- To enhance writing skills
- To write simple, compound and complex sentences

Outcome:

- Develop communicative skills

UNIT –I

Jumbled words

Paragraph writing

UNIT –II

Prefix and suffix

Precise writing

UNIT –III

Eponyms

Summarizing

UNIT –IV

Compound words

Simple, Compound and Complex

UNIT –V

Homophones

Essay writing

[SKILL DEVELOPMENT]

References:-

A Practical English Grammar

-A.J Thomson and A.V.Martinet

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma &Sangeetha Sharma

DEPARTMENT OF PHYSICS

PRIST UNIVERSITY

Declared Under Section 3 of UGC Act, 1956

Thanjavur, Tamilnadu, India



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M.Sc., PHYSICS

REGULATION - 2020

SYLLABUS UNDER RESEARCH INTEGRATED CURRICULUM

(2022-23)

1.1.3	colour
employability	
Skill development	
ENTREPRENEURSHIP	
EMPLOYABILITY,/ENTREPRENEURSHIP,/SKILL DEVELOPMENT	
EMPLOYABILITY,/SKILL DEVELOPMENT	
EMPLOYABILITY,/ENTREPRENEURSHIP	



M.Sc., PHYSICS -SYLLABUS – REGULATION 2020
COURSE STRUCTURE
2022-23

Course Code	Course Title	L	T	P	C
SEMESTER I					
20213AEC11	Advanced Mathematical Physics	6	1	0	5
20213AEC12	Classical and Statistical Mechanics	6	1	0	5
20213AEC13	Electronics and Communication	6	1	0	4
20213SEC14L	Spectroscopy and General Electronics Lab	0	0	4	2
20213DSC15_	Discipline Specific Elective – I	5	0	0	4
20213RLC16	Research Led seminar	-	-	-	1
	Total	23	3	4	21
SEMESTER II					
20213AEC21	Microprocessor and Microcontroller	5	1	0	5
20213AEC22	Quantum Mechanics	5	1	0	5
20213AEC23	Condensed Matter Physics	5	0	0	4
20213SEC24L	Advanced General Experiments Lab	0	0	4	2
20213DSC25_	Discipline Specific Elective – II	5	0	0	4
20213RMC26	Research Methodology	3	0	0	2
20213BRC27	Participation in Bounded Research	-	-	-	2
	Total	23	2	4	24
SEMESTER III					
20213AEC31	Electro Magnetic Theory	6	1	0	6
20213AEC32	Nuclear and Particle Physics	6	1	0	6
20213SEC33L	Advanced Electronics Lab	0	0	5	3
20213DSC34_	Discipline Specific Elective – III	5	0	0	4
202__OEC35_	Open Elective	4	0	0	3
20213SRC36	Participation in Scaffold Research (Societal Project)	-	-	-	2
	Total	21	2	5	24
SEMESTER IV					
20213AEC41	Laser Physics And Non Linear Optics	6	1	0	6
20213AEC42	Numerical Methods and Computational Physics	6	1	0	6
20213SEC43L	Numerical Methods Lab with C++ Programming	0	0	5	3
20213DSC44_	Discipline Specific Elective – IV	5	0	0	4
20213PRW45	Project Work	0	0	0	6
20213PEE	Programme Exit Examination	-	-	-	2
	Total	20	2	5	27
	Total Credits for the Programme				96

Discipline specific Electives

Semester	Discipline specific Elective Courses- I
I	a) 20213DSC15A - Instrumentation b) 20213DSC15B - Medical Physics c) 20213DSC15C - Physics Workshop Skill d) 20213DSC15D - Computational Physics e) 20213DSC15E – Advanced Crystal Techniques
Semester	Discipline specific Elective Courses -II
II	a) 20213DSC25A - Atomic and Molecular Physics b) 20213DSC25B - Basic Instrumentation Skills c) 20213DSC25C - Renewable Energy d) 20213DSC25D - Radiation Safety e) 20213DSC25E – Weather Forecasting
Semester	Discipline specific Elective Courses -III
III	a)20213 DSC34A-Non-Conventional Energy Physics b) 20213DSC34B - Fluid Mechanics c) 20213DSC34C - Electromagnetic Induction d) 20213DSC43D - Waves and Optics e) 20213DSC34E – Thermal Physics
Semester	Discipline specific Elective Courses -IV
IV	a) 20213DSC44A-Nano Science and Technology b) 20213DSC44B- Analog Systems and Applications c) 20213DSC44C- Elements of Modern Physics d) 20213DSC44D- Digital Systems and Applications e)20213DSC44E- Experimental Techniques

OPEN ELECTIVE COURSE

Semester	General Elective Courses
III	a) 202ENOEC-Writing for the Media b) 202MAOEC-Applicable Mathematics Techniques c) 202CHOEC- Green Chemistry d) 202BCOEC-Herbal Medicine e) 202CSOEC-M-Marketing f) 202CMOEC- Financial Services g) 20280OEC – Counselling and Psychology

Credit Distribution:

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	14	2	4	-	1	-	21
II	14	2	4	-	4	-	24
III	12	3	4	3	2	-	24
IV	12	3	4	-	6	2	27
Total	52	10	16	3	13	2	96

Course Code	CORE PAPER – I ADVANCED MATHEMATICAL PHYSICS	L	T	P	C
20213SEC11		6	2	0	5

Aim:

- To learn various mathematical concepts and techniques in vector space, groups and functions of special types to solve physical problems

UNIT – I: MATRIX THEORY

Definitions of basic matrix theory – Rank of matrix – Inverse matrix – characteristic matrix and characteristic equation of a matrix – Cayley –Hamilton theory – characteristic root and vectors of a matrix [eigen values & eigen vectors] – Diagonalization of matrices.

VECTOR FIELDS:

Line, surface and volume integrals – Divergence of vector function – curl of vector function – Gauss divergence theorem – Stokes theorem – Green’s theorem – Orthogonal curvilinear coordinate systems: Expression for gradient, divergence, curl and Laplacian.

[EMPLOYABILITY]

UNIT – II: COMPLEX ANALYSIS

Functions at Complex Variables- Differentiability – Cauchy – Riemann Conditions – Complex Integration – Cauchy’s Integral Theorem and Integral Formula – Taylor’s and Laurent’s series – Residues and Singularities – Cauchy Residue Theorem – Evaluation of Definite Integrals.

UNIT – III

Fourier Series – Sine and Cosine Half Range Series – Fourier Transformations – Sine and Cosine Transforms – Faltung Theorem- Application to Heat and Wave Equation.

Laplace Transform – Convolution Theorem – Solution of Ordinary Equations.

UNIT – IV

Gamma and Beta Functions – Series Solution – Legendre, Bessel, Laguerre and Hermite Differential Equations – Rodriguez Formula – Generating Functions – Orthogonality Relations – Important Recurrence Relations.

UNIT - V: NUMERICAL METHODS

Principals of Least Square – Curve Fitting – Parabola- Exponential – Solutions of Numerical Algebraic and Transcendental Equations – Newton Raphson Method – solution of simultaneous Linear Algebraic Equations – Gauss Elimination Method – Numerical Integration – Trapezoidal Rule, Simpson’s

1/3 Rule- Solution of Ordinary Differential Equations – Euler's Method – Second Order and fourth order Runge-Kutta Method.

[EMPLOYABILITY]

Books for Study and Reference:

1. E. Kreyszig, Advanced Engineering Mathematics. (Wiley Eastern, New Delhi, 1983)
2. G. Arfken and H.J. Weber, Mathematical Methods of Physics.
3. A.K. Ghatak, I.C. Goyal and A.J. Chua, Mathematical physics.
4. W.W. Bell, Special Functions for Scientists and Engineers.
5. Transforms – Goyal Gupta.
6. Numerical methods for scientist and engineers – M.K. Venkatraman.
7. Mathematical Physics – B.D. Gupta.

Course Code	CORE PAPER – II CLASSICAL AND STATISTICAL MECHANICS	L	T	P	C
20213SEC12		6	1	0	5

Aim:

- To learn various mathematical techniques of classical mechanics and their applications to physical systems and introduce relativistic dynamics.

UNIT – I: FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION

Constraints - Generalised Co-ordinates – D’Alembert’s Principle and Lagrange’ Equation – Hamilton Formulation – Lagrange’s Equation of Motion.

LAGRANGIAN FORMULATIONS – APPLICATIONS:

Theory of Small Oscillations – Normal Modes – Wave Motion – Wave Equation. Euler Angles – Euler’s Equations – Linear Tri Atomic Molecule.

UNIT – II: HAMILTON’S FORMULATION

Hamilton’s Canonical Equation of Motion – Hamilton’s Equation from Variation Principle – Principle of Least Action Poisson Brackets – Invariance of PB Under canonical Transformation Method – Action Angle Variable.

[EMPLOYABILITY]

UNIT –III: NON – LINEAR DYNAMICS

Regular and Chaotic Motions – Linear and Non-Linear Forces – Dissipative and Conservative Systems – Discrete and Continues Time Dynamical System – Logistic Map – Fixed Point Analysis – Period Doubling Phenomena – Route to Chaos – Characterization of Chaos – Dynamic of MLC Circuits.

SOLUTION: Linear and Non – Linear Waves – Solitary – Kdv Equation.

UNIT – IV: CLASSICAL STATISTICAL MECHANICS

Macro and Micro States – Statistical Equilibrium – Phase Space and Ensembles – Density Function – Liouville’s Theorem – Maxwell – Boltzmann Distribution Laws – Micro Canonical Ensembles – Ideal Gas Entropy – Partition Function – Principle of Equipartition of Energy - Canonical and Grand Canonical Ensembles.

UNIT – V: QUANTUM STATISTICAL MECHANICS

Basic Concepts – Quantum Ideal Gas – Bose Einstien and Fermi Dirac Statistics – Distribution Laws – Sackur – Tetrode Equation – Equation of State – Bose Einstein Condensation.

Ideal Bose Gas – Black Body and Plank's Radiation – Phonons – Liquid Helium – Degeneracy – Fermi Gas – Pauli's Para Magnetism.

[EMPLOYABILITY]

References:

1. Classical Mechanics – Golstien
2. Classical Mechanics – Gupta Kumar

Course Code	CORE PAPER – III ELECTRONICS AND COMMUNICATIONS	L	T	P	C
20213SEC13		6	1	0	4

Aim:

- To understand the working of advanced semiconductor devices and digital circuits and the utility of OP-AMP and learn the basics of integrated circuit fabrication, applications of timer IC-555 and building block of digital systems.

UNIT – I: OPTO ELECTRONICS

LED – applications – Photo emissive devices – Photomultiplier tube – photovoltaic devices – Bulk type photoconductive cell – Photodiodes – Phototransistor – LCD – applications.

POWER ELECTRONICS

TRIAC – construction – operation – characteristics – application – DIAC – application – Unijunction transistor (UJT) – equivalent circuit – application.

UNIT – II: TELEVISION FUNDAMENTALS

Introduction to Antenna – Current and voltage Distribution – UHF Antenna – Horn Antenna – Wide Band Antenna – Log Periodic Type – Loop Antenna.

Essential of Colour T.V.: Colour perception – Three colour theory – Luminance, Hue and Saturation – Colour T.V. camera – Luminance signal – colour T.V. display tubes – Delta-gun – Gun-in-line – trinitron colour picture tube – NTSC colour T.V. system – PAL colour T.V. system.

UNIT – III: COMMUNICATION SYSTEMS

Pulse Modulation – Time Division Multiplexing – Pulse Time Modulation – Pulse width Modulation – Pulse code Modulation – Basic Digital Communication System – Amplitude Shift Keying – Phase Shift keying and Frequency Shift Keying.

UNIT – IV: FIBER OPTIC COMMUNICATION

Basic Optical Laws and Definitions – Optic Fiber Modes and Configurations- Wave equation for Step Index Fiber – Graded Index Fiber Structure – Fiber materials – Fiber Fabrications – Double Crucible Method – Attenuation – Lensing Schemes for Coupling – Fiber to Fiber Joints – Optical Fiber Connectors- Optical Source – LED, Laser Diode – Photo Detectors – Noise Detector Responding Time.

[EMPLOYABILITY]

UNIT – V: SATELLITE COMMUNICATION

Introduction Satellite Communication System – Satellite orbits – Basic Components of Satellite Communication – Constructional Features – Commonly used Frequencies – Communication Package Communication in India. ISDN, LAN, VAN.

Books for Study and Reference:

1. Principals of Communication Engineering – Anokh Singh, A.K. Chabra, S. Chand.
2. Electronic Communication System – Kennedy and Davis, Tata McGraw Hill Edition.
3. Optical Fiber Communications – Gerd Keiser, McGraw Hill International Editions.
4. Basic electronics solid state – B.L. Theraja, S. Chand & co.
5. Principals of Electronics – V.K. Metha, Rohit Metha, S. Chand & co Ltd.
6. Monochrome and colour television – R.R. Gultai, New Age International (P) Ltd Publishers, New Delhi.

Course Code	CORE PRACTICAL –I SPECTROSCOPY AND GENERAL ELECTRONICS LAB	L	T	P	C
20213SEC14L		0	0	4	3

Aim:

- Experimental determination of certain physical constants and its properties.
- Experimental verification of characteristics and applications of electronic components with devices.

SECTION A

1. Determination of q , n , σ by elliptical fringes method.
2. Determination of q , n , σ by hyperbolic fringes method.
3. Determination of Stefan's Constant.
4. Determination of dielectric constant at a high frequency by Lecher wire.
5. Determination of e/m of an electron by Thomson's method.
6. Iron Arc spectrum.
7. Copper Arc spectrum.
8. Brass Arc spectrum.

SECTION B

1. Feed back amplifier.
2. Characteristics of JFET.
3. Characteristics of UJT.
4. Characteristics of SCR.
5. Characteristics of LDR.
6. Common sources amplifier using FET.
7. Design and study of Bistable multivibrator using 555 timer.
8. Opamp CMRR, inverting and non inverting amplifiers.

Course Code	DISCIPLINE SPECIFIC ELECTIVE COURSE-I	L	T	P	C
20213DSC15A	INSTRUMENTATION	5	0	0	4

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

UNIT I: DISPLACEMENT MEASUREMENT

Electrical Method – The Strain Gauge – The LVDT – Capacitance Gauges – Piezoelectric Material – Piezo Electrical Transducers.

UNIT II: PRESSURE MEASUREMENT

Manometers – Elastic Types – Bourdon Tubes – Diaphragm Elements – Bellows Elements – Electrical Transducers as Secondary Transducers – Resistive Transducers – Inductive Transducers – Measurements of Low Pressure (Vacuum gauges) - Thermo Couple Vacuum Gauge – Pirani Gauges.

UNIT III: TEMPERATURE MEASUREMENT

Resistance Thermometers – Bi Metallic Thermometers - Radiation Pyrometers – Radiation Receiving Elements – Total Radiation Pyrometers – Infra-red Pyrometers – Optical Pyrometers – Measurements of Very High or Stellar Temperature.

UNIT IV: FLOW MEASUREMENT

Flow Rate Sensing Elements – Measurement of Flow – Turbine Meters – Electromagnetic Flow Meters - Hot Wire Anemometers – Flow Meter Using Thermistors – Ultrasonic Flow Transducers.

UNIT V: MEASUREMENT OF LEVEL , THICKNESS AND HUMIDITY

Electrical Methods – Resistive Method – Inductive Methods – Capacitive Methods – Measurement of Liquid Level with Gamma Rays – Liquid Level Measurement Using Float. Measurement of Thickness: Inductive Methods – Ultrasonic Vibration Methods – Measurement of Humidity.

[ENTREPRENEURSHIP]

Book for Study:

1. A Course in Electrical and Electronic Measurement and Instrumentation – A.K. Sawhney

Course Code	Course Title	L	T	P	C
20213DSC15B	Medical Physics	5	0	0	4

UNIT - 1

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I

X-RAYS: Electromagnetic spectrum – production of x-rays – x-ray spectra- Bremsstrahlung- Characteristic x-ray – X-ray tubes – Coolidge tube – x-ray tube design – tube cooling stationary mode – Rotating anode x-ray tube –HT cables.

UNIT - II

RADIATION PHYSICS: Radiation units - exposure - absorbed dose – units: rad, gray - relative biological effectiveness - effective dose - inverse square law - interaction of radiation with matter Geiger counter – Scintillation counter – ionization chamber – Dosimeters – survey methods – area monitors – TLD and semiconductor detectors.

UNIT - III

MEDICAL IMAGING PHYSICS: X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR) – NMR imaging – MRI Radiological imaging – Radiography – magnetic resonance imaging – thyroid uptake system – Gamma camera (Only Principle, function and display)

UNIT - IV

RADIATION THERAPY PHYSICS: Radiotherapy – kilo voltage machines – deep therapy machines – Telecobalt machines – Medical linear accelerator. Basics of Teletherapy units – deep x-ray, Telecobalt units, medical linear accelerator –bolus – percentage depth dose – tissue – air ratio – back scatter factor.

UNIT - V

RADIATION AND RADIATION PROTECTION: Principles of radiation protection – protective materials-radiation effects – somatic, genetic stochastic & deterministic effect, Personal monitoring devices - Radiation monitors.

[ENTREPRENEURSHIP]

References:

- Medical Physics, J.R. Cameron and J.G.Skofronick, Wiley (1978)
- Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)

Course Code	Course Title	L	T	P	C
20213DSC15C	PHYSICS WORKSHOP SKILL	5	0	0	4

UNIT – I

Introduction: Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

UNIT – II

Mechanical Skill I: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood.

UNIT – III

Mechanical Skill II:

Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothing of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

UNIT - IV

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

UNIT - V

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

[ENTREPRENEURSHIP]

Reference Books:

- A text book in Electrical Technology - B L Theraja – S. Chand and Company.
- Performance and design of AC machines – M.G. Say, ELBS Edn.

Course Code	Course Title	L	T	P	C
20213DSC15D	COMPUTATIONAL PHYSICS	5	0	0	4

UNIT – I

Introduction:

Importance of computers in Physics, paradigm for solving physics problems for solution. Usage of linux as an Editor.

UNIT – II

Algorithms and Flowcharts:

Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of $\sin(x)$ as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal.

UNIT – III

Scientific Programming:

Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators.

UNIT – IV

Expressions:

Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non-Executable Statements, Layout of Fortran Program, Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems.

UNIT – V

Control Statements: Types of Logic (Sequential, Selection, Repetition), Branching Statements (Logical IF, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO-CONTINUE, DO-ENDDO, DOWHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO, Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and

Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, open a file, writing in a file, reading from a file. Examples from physics problems.

[ENTREPRENEURSHIP]

Reference Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.
- Computer Programming in Fortran 77". V. Rajaraman (Publisher:PHI).
- LaTeX–A Document Preparation System", Leslie Lamport (Second Edition, Addison-Wesley, 1994).
- Gnuplot in action: understanding data with graphs, Philip K Janert, (Manning 2010)
- Schaum's Outline of Theory and Problems of Programming with Fortran, S Lipsdutz and A Poe, 1986Mc-Graw Hill Book Co.

Course Code	ADVANCED CRYSTAL TECHNIQUES	L	T	P	C
20213DSC15E		5	0	0	4

AIM:

To introduce the knowledge on crystal growth and characterization.

OBJECTIVE:

To expose the students with theories of nucleation• & crystal growth, crystal growth by from solution, melt and vapour phase and their characterization.

Unit – 1: Crystal growth theory

Classical theory of nucleation: Gibbs Thomson equation for vapour and solution – Modified Thomson’s Equation for melt – Spherical nucleus – Cylindrical nucleus - Heterogeneous nucleation – cap-shaped nucleus – disc shaped nucleus – Kinetics of crystal growth – Kossel, Stranski, Volmer (KSV) theory – Burton, Cabrera and Frank (BCF) theory.

Unit – 2:Solution growth

Low temperature solution growth – Expression of supersaturation – Methods of crystallization – Constant temperature bath – Nonlinear phenomena in KDP family crystals – High temperature solution growth – Principles of Flux growth.

Unit – 3: Gel growth

Growth from gel: structure and properties of gel – single diffusion method – Double diffusion method.

Unit – 4: Melt growth

Growth from melt: Bridgmann and related technique – Crystal pulling technique – Liquid encapsulated Czochralski technique – Zone melting technique – Skull melting process – Verneuil process.

Unit – 5: Vapour Growth

Physical vapour deposition – Chemical vapour transport – hydrothermal growth – low pressure autoclaves - high pressure autoclaves – growth of zinc oxides – growth of garnets Electrocrystalization – electro chemical potential – Nernst relation – Voltametry.

[ENTREPRENEURSHIP]

References:

1. Crystal Growth processes and methods – P.Ramasamy, P. Santhanaraghavan, KRU Publication.
2. J.C. Brice, The growth of crystals from liquid (North Holland Publishing Co., Amsterdam).

Course Code	CORE PAPER – IV MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
20213SEC21		6	0	0	5

Aim:

- To learn basic principles of architecture and functioning of microprocessor and microcontroller and programming and interfacing aspects of them.

UNIT – I: MICROPROCESSOR 8085

8085 Microprocessor – Bus Architecture – registers – Central processing unit – timing and control unit – Instruction and Data flow – System timings – Examples – Instruction set – Data transfer group – Logical group – Branch group – Stack and I/O control instructions – Addressing modes.

UNIT – II: ASSEMBLY LANGUAGE PROGRAMS (8085 ONLY)

Addition – Subtraction – Multiplication – Division – BCD arithmetic – Searching an array for a given number – Choosing the biggest and smallest numbers from a list – Ascending and Descending order – Square root of a number – Time Delay – Square wave generator.

UNIT – III: MICROPROCESSOR 8086

Organization of the 8086 Microprocessor – Memory organization – Register structure – Addressing modes in 8086 – Minimum mode and maximum mode – Exception handling in 4086 – Assembler and Multiprocessing – Assembler – Directives and operators – Data definition and storage allocation – Assigning names and expressions – Segment definition – Program definition – Alignment directives.

UNIT – IV: INTERFACING MEMORY AND I/O DEVICES

Interfacing memory and devices – I/O and memory mapped I/O – Types of interfacing devices – Data transfer schemes – Programmed and DMA data transfer schemes – Programmable Peripheral Interface (8255 A) – 8253 Timer Interface – DMA controller – Programmable Interrupt Controller (8259) – Programmable communication interface (8251).

[EMPLOYABILITY]

UNIT – V: MICROCONTROLLER 8051

Introduction of Microprocessor and Micro controllers – Comparison of microprocessor and microcontrollers – 8051 architecture – Internal memory – Input output pins, ports external memory – Addressing modes.

Instruction set of 8051 – Data transfer instruction – Arithmetic instruction – Branch instruction – Bit manipulation instruction.

Books for Study and Reference:

1. R. Goankar, Microprocessor Architecture, programming and applications (Wiley Eastern).
2. B. Ram, Fundamentals of Microprocessor and Microcomputers (Dhanapet Rai & Sons).
3. Introduction to Microprocessor – Aditya P. Mathur.
4. Microcomputer System 8086/8088 Family – Yuchngliv and clenn A Gibson Prentice Hall.
5. Microprocessors and Interfacing – Programming and Hardware Douglas V Hall.
6. The 8051 Microcontroller Architecture, Programming & Applications – Kenneth J. Ayla, Penram International Publishing (India).

Course Code	CORE PAPER – V QUANTUM MECHANICS	L	T	P	C
20213SEC22		6	0	0	5

Aim:

- To learn the fundamental concepts and certain theoretical methods of quantum mechanics and their applications to microscopic systems.

UNIT I: SCHRODINGER EQUATION AND GENERAL FORMULATION

Schrodinger Equation – Physical Meaning and Condition on the Wave Function – Expectation Values and Ehrenfest's Theorem – Hermitian Operators and their Properties – Commutation Relation Uncertainty Relation – Bra and Ket Vectors – Schrodinger, Heisenberg and Interaction Pictures.

UNIT II: EXACTLY SOLVABLE SYSTEM

Liner Harmonic Oscillator – Solving the one Dimensional Schrodinger Equation – Abstract Operator Method – Particle in a Box-Square Well Potential – Rectangular Barrier Potential – Rigid Rotator – Hydrogen Atom.

UNIT III: APPROXIMATION METHODS

Time Independent Perturbation Theory: Non-degenerate and Degenerate Perturbation Theories – Stark Effect – WKB Approximation – Application to Tunneling Problem and Quantization Rules.

Time Dependent Perturbation Theory: Harmonic Perturbation – Transition Probability.

UNIT IV: SCATTERING THEORY

Scattering Cross Section – Born Approximation – Partial Wave Analysis.

Angular Momentum: Matrix Representation of J-Spin Angular Momentum – Eigen Values – Addition of Angular Momenta – Clebsch –Gordan Coefficients (Basics Idea only).

UNIT V: RELATIVISTIC QUANTUM MECHANICS

Klien-Gordan Equation for a Free Particle and in Electromagnetic Field – Dirac Equation for a Free Particle. Charge and Current Densities – Dirac Matrices – Plane Wave Solution – Negative Energy States – Spin Angular Momentum – Spin-Orbit Coupling.

[EMPLOYABILITY]

Books for Study:

1. Quantum Mechanics by L.Schiff - Tata McGraw Hill.
2. A Text Book of Quantum Mechanics by P.M.Mathews and K.Venkatesan - Wiley Eastern.
3. Quantum Mechanics by V.K.Thankappan – Wiley Eastern.
4. Quantum Mechanics by A.Goswamy

Course Code	CORE PAPER – VI CONDENSED MATTER PHYSICS	L	T	P	C
20213SEC23		6	0	0	5

Aim:

- To learn the basics of crystal structure and underlying theoretical development for the description of certain properties and phenomena of solid states.

UNIT – I: CRYSTAL STRUCTURE

Crystal classes – symmetry elements – 2D, 3D lattices – Bravais lattices – Symmetry point groups – Atomic scattering factor – Structure factor.

Defects in solids: Point defect – Line defect – Surface defect – volume defect – effects of crystal imperfections.

UNIT – II: LATTICE, VIBRATIONS AND THERMAL PROPERTIES

Vibration of monoatomic lattice – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons – Lattice heat capacity – Einstein model – Density of modes in one-dimension and three-dimension – Debye model of the lattice heat capacity – Thermal conductivity.

UNIT – III: FREE ELECTRON THEORY, ENERGY BANDS AND SEMICONDUCTOR CRYSTALS

Introduction – Free electron gas – sommerfield model – density of electron states – Schottky effect – Photoelectric effect – Photoelectric emission. Band theory: Energy spectra in atoms molecules and gases – Wave equation in a periodic potential – Bloch theorem – Kronig-penney model – Electrical conductivity and Ohm's law – Motion in magnetic fields – Hall effect – Thermo-electric effect – Peltier effect – Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration.

[EMPLOYABILITY]

UNIT – IV: DIAMAGNETISM, PARAMAGNETISM, FERRO MAGNETISM AND ANTIFERROMAGNETISM

Langevin classical theory of diamagnetism and paramagnetism – Weiss theory – Quantum theory of paramagnetism – Demagnetisation of a paramagnetic salt – paramagnetic susceptibility of conduction electrons – Hund's rules – Kondo effect – Ferroelectric order – Curie point and exchange integral – Temperature dependence of saturation magnetization – Ferromagnetic order – Antiferromagnetic order – Ferromagnetic domains – Origin of domains – Coercive force and hysteresis.

UNIT – V: DIELECTRICS AND FERROELECTRICS AND SUPERCONDUCTIVITY

Macroscopic electric field – Local electric field at an atom – Dielectric constant and polarizability – Clausius-Mossotti equation – Polarization catastrophe – Ferroelectric domain – Occurrence of superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – Coherence length – BCS theory – Flux Quantization – Type I and Type II superconductors – Josephson superconductor tunneling – DC and AC Josephson effect.

Books for Study and Reference:

1. C. Kerrel, Introduction to Solid State Physics (Wiley Eastern, NewDelhi).
2. N.W. Ashorof and N.D. Mermin, Solid State Physics (Hot. Rinehart and Winston).
3. A.J. Dekker, Solid State Physics, (McMillian, Madras).
4. Gupta and Kumar, Solid State Physics (K. Nath & co., Meerut).
5. M. Arumugam, Material science (Anuradha agencies publishers).
6. S.O. Pillai, Solid State Physics (New Age International, NewDelhi).

Course Code	CORE PRACTICAL – II ADVANCED GENERAL EXPERIMENTS	L	T	P	C
20213SEC24L	LAB	0	0	4	3

Aim:

- Experimental determination of certain physical constants and its properties with the suitable experiments.

(Any 10 from the following)

1. Determination of magnetic susceptibility of liquid by Guoy method.
2. Determination of magnetic susceptibility of solid by Guoy method.
3. Determination of magnetic susceptibility of powder sample by Guoy method.
4. Determination of magnetic susceptibility of liquid by quinck's method.
5. Determination of wavelength and thickness of a film by using Michelson's interferometer.
6. Charge of an electron by spectrometer.
7. Polarizability of liquids by finding the refractive index at different wavelength.
8. Determination of wavelength of monochromatic source using biprism.
9. Determination of refractive index of liquids using biprism (scale and telescope method).
10. Determination of specific rotatory power of a liquid using polarimeter.
11. Rydberg's constant using spectrometer.
12. Forbe's method – Thermal conductivity.
13. Laser grating – Determination of wavelength.
14. Optical Fiber – Numerical aperture.
15. Brass Arc spectrum.

Course Code	DISCIPLINE SPECIFIC ELECTIVE COURSE-II	L	T	P	C
20213DSC25A	ATOMIC AND MOLECULAR PHYSICS	5	0	0	4

Aim:

- To familiarize with the basic principles of various spectroscopic techniques and their applications in the determination of atomic structure, chemical composition and physical properties of materials.

UNIT - I: ATOMS IN EXTERNAL FIELDS AND QUANTUM CHEMISTRY

Quantum theory of Zeeman, Stark and Paschen Back effect.

QUANTUM CHEMISTRY OF MOLECULES:

Born – Oppenheimer approximation – Heitler – London theory of hydrogen – Concept of atomic, hybrid and molecular orbital's- LCAO treatment of molecular orbitals of CH₄, C₂H₆ and C₂H₄- Huckels molecular approximation- Application to butadiene and benzene.

UNIT – II: MICROWAVE SPECTROSCOPY

Rotational spectra of diatomic molecules – Rigid rotator – Non rigid rotator – Effect of isotopic substitution – Rotation spectra of polyatomic molecules – linear, symmetric top and asymmetric top molecules – Experimental technique.

IR SPECTROSCOPY:

Vibrating diatomic molecule – Vibrating Rotator – Linear symmetric top molecule – characteristics and group frequencies – Experimental technique.

UNIT –III: RAMAN SPECTROSCOPY

Raman effect and Quantum theory of Raman effect - Rotational and vibration Raman shifts of diatomic molecules

ELECTRONIC SPECTROSCOPY OF MOLECULES:

Electronic Spectra of Diatomic Molecules – Frank Condon Principle – Dissociation energy and Dissociation products – Rotational fine structure of electronic vibration transitions .

[ENTREPRENEURSHIP]

UNIT – IV: RESONANCE SPECTROSCOPY

NMR:

Basic principles – Classical and Quantum Mechanical Description – Bloch equations – Spin – Spin and Spin lattice relation times – Experimental method – Single coil & double coil methods – high resolution methods.

ESR:

Basic Principle ESR Spectrometer – Nuclear interaction & Hyperfine structure – Relaxation effects – g- factor – characteristics – Free radical studies & biological application.

UNIT – V: LASERS

Emission and absorption of radiation – Einstein relations – absorption of radiation – population inversion – Optical feedback – Threshold conditions – Laser modes – Single mode operation – frequency Stabilization – mode locking – laser applications – Holography – Holographic computer memories – Laser induced nuclear fusion.

Books for Study & Reference

1. C.N. Bannwell – Fundamental of molecular spectroscopy
2. B.P. Straughan & S. Walker – Spectroscopy – Vol -1
3. H.S. Marry & G.K. Metita – Introduction to Modern physics
4. A.K. Chandra, Introductory quantum Chemistry
5. Proble, Sctineducer & Berstein, High Resolution NMR
6. G.M. Barrow, Introduction to Molecular Spectroscopy
7. C.P. Slotcher, Principles of Magnetic Resonance
8. R. Charng, Basic Principles of Spectroscopy.
9. J. Wilson, J.F.B. Hawkes Optoelectronics an introduction, Prentice Hall of India, New Delhi.
10. Pallab Bhattacharya, Semiconductor optoelectronic devices Prentice Hall of India, New Delhi

Course Code	Course Title	L	T	P	C
20213DSC25B	BASIC INSTRUMENTATION SKILLS	5	0	0	4

UNIT – I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

UNIT – II

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

UNIT – III

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

UNIT – IV

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

UNIT – V

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

[ENTREPRENEURSHIP]

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
- Performance and design of AC machines - M G Say ELBS Edn.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

Course Code	Course Title	L	T	P	C
20213DSC25C	RENEWABLE ENERGY	5	0	0	4

UNIT – I

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

UNIT – II

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

UNIT – III

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

UNIT – IV

Geothermal Energy: Geothermal Resources, Geothermal Technologies.

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources.

Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power

UNIT – V

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications Carbon captured technologies, cell, batteries, power consumption Environmental issues and Renewable sources of energy, sustainability.

[ENTREPRENEURSHIP]

Reference Books:

- Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
- Solar energy - M P Agarwal - S Chand and Co. Ltd.
- Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
- Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004,

Course Code	Course Title	L	T	P	C
20213DSC25D	Radiation Safety	5	0	0	4

UNIT – I

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

UNIT – II

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources,

Interaction of Photons – Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients,

Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung),

UNIT – III

Interaction of Neutrons- Collision, slowing down and Moderation. Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC).

UNIT – IV

Radiation detection: Basic concept and working principle of *gas detectors* (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), *Scintillation Detectors* (Inorganic and Organic Scintillators), *Solid States Detectors* and *Neutron Detectors*, *Thermo luminescent Dosimetry*.

UNIT – V

Radiation safety management: *Biological effects of ionizing radiation*, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

[ENTREPRENEURSHIP]

Reference Books:

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)
2. G.F.Knoll, Radiation detection and measurements
3. Thermoluminescence Dosimetry, Mcknlly, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)
4. W.J. Meredith and J.B. Massey, “Fundamental Physics of Radiology”. John Wright and Sons, UK, 1989.
5. J.R. Greening, “Fundamentals of Radiation Dosimetry”, Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.

Course Code	WEATHER FORECASTING	L	T	P	C
20213DSC25E		5	0	0	4

UNIT – I

Introduction to atmosphere: Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

UNIT – II

Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws.

UNIT – III

Weather systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes.

UNIT – IV

Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

UNIT – V

Basics of weather forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

[ENTREPRENEURSHIP]

Reference books:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.

Course Code	RESEARCH METHODOLOGY	L	T	P	C
20213RMC26		3	0	0	3

Aim:

- To enhance the ability of research work along with document preparation for journal publication.

UNIT I: INTRODUCTION TO RESEARCH METHODOLOGY

Objectives of research – Types of research – Significance of research. Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT II: DATABASE AND LITERATURE SURVEY

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT III: DATA ANALYSIS AND CHEMICAL PACKAGES:

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – Normal distribution curve – Statistical treatment of finite samples – t test and F test (ANOVA) co -variance (ANCOVA) correlation and multiple regression analysis – Chemical Packages – ChemDraw – ChemSketch – ISIS draw – Origin.

UNIT IV: THESIS AND PAPER WRITING:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

UNIT V: LABORATORY SAFETY AND NUMERICAL METHODS

Basic laboratory guidelines – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers. Laboratory injuries and treatment. Chemical spills – Mercury and Biohazardous – clean up procedure - Accident management - Disposal of chemicals and glass wares.

Solutions of equations - Simple iterative methods - Newton - Raphson method - Numerical Integration - Simpson's 3/8 rule - Runge Kutta method II order - Solution of

Simultaneous equation - Differentiation - Numerical differentiation with interpolation polynomials. [SKILL DEVELOPMENT]

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.
6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill
7. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi

Course Code	CORE PAPER – VII ELECTROMAGNETIC THEORY	L	T	P	C
20213SEC31		6	0	0	5

Aim:

- To learn the theory for the fields produced by stationary and moving charge and charged systems and propagation of electromagnetic fields.

UNIT – I: INTRODUCTION TO ELECTROSTATICS

Coulomb's law- Electric field – Gauss Law – Scalar potential – Surface distribution of charges and dipoles – Poisson and Laplace Equation – Green's theorem – Dirichlet and Neumann boundary conditions – electrostatic boundary value problems : Methods of Images Illustrations: Point charge in the presence of (i) a grounded conducting sphere. (ii) a charged insulated and conducting sphere.

UNIT – II: ELECTROSTATICS OF MACROSCOPIC MEDIA

Multipole expansion – Boundary value problems with dielectric Illustration (i) a point charge embedded at a distance away from a dielectric interface. (ii) Dielectric sphere in a uniform electric field. Molecular polarizability and electric susceptibility Electrostatic energy in dielectric media.

UNIT – III: MAGNETOSTATICS

Biot and Savart law – Force between current carrying conductors – Differential equations of magnetostatics and Ampere's law – Vector potential – Force and torque and energy of a localized current distribution in an external magnetic induction – Macroscopic equations.

UNIT – IV: ELECTROMAGNETICS

Faraday's law in induction – Maxwell's displacement current – Maxwell equations Maxwell equations in terms of vector and scalar potentials – Gauge transformations Lorentz gauge, Coulomb gauge – Poynting's theorem – Conservation of energy and momentum for a system of charged particles and electromagnetic fields.

UNIT – V: ELECTROMAGNETIC WAVES AND WAVE PROPAGATION

Electromagnetic waves – reflection – refraction – dispersion and polarization – wave guides – charge particle in electric and magnetic fields – Radiation from moving charges, dipoles and retarded potentials. [EMPLOYABILITY]

Books for Reference:

1. J.D.Jackson, Classical Electrodynamics, Wiley Eastern 1988.
2. David. J. Griffiths, Introduction to Electrodynamics, PHI, New Delhi, 1995.
3. EC. Jordon and K.G. Balmain , Electromagnetic waves and Radiating System.
4. Chopra & Agrawal, Electromagnetic theory, K.Nath & co- Mccrut.

Course Code	CORE PAPER – VIII NUCLEAR AND PARTICLE PHYSICS	L	T	P	C
20213SEC32		6	0	0	5

Aim:

- To learn the various aspects of nucleus and its behavior under various conditions.

UNIT I: BASIC NUCLEAR PROPERTIES

Nuclear Size, Shape, Mass – Charge Distribution – Spin and Parity – Binding Energy – Semi Empirical Mass Formula – Nuclear Stability – Mass Parabola – Nature of Nuclear Forces – Ground State of Deuteron – Magnetic Dipole Moment of Deuteron – Proton-Neutron Scattering at Low energies – Scattering Length, Phase Shift – Properties of Nuclear Forces – Spin Dependences – Charge Symmetry – Charge Independence – Repulsion at Short Distances – Exchange Forces – Meson Theory.

UNIT II: RADIO ACTIVE DECAYS

Alpha Emission – Geiger-Nuttal Law – Gamow Theory – Neutrino Hypothesis – Fermi Theory of Beta Decay–Selection Rules – Non-conservation of Parity – Gamma Emission – Selection Rules-Internal Conversion – Nuclear Isomerism – Interaction of Charged Particles and X-rays with Matter – Basic Principles of Particle Detectors – Ionization Chamber – Proportional Counter and G.M. Counters – Solid State Detectors – Scintillation and Semiconductor Detectors.

UNIT III: NUCLEAR REACTION AND NUCLEAR MODELS

Q-Values and Kinematics of Nuclear Cross Section – Energy and Angular Dependence – Reciprocity Theory – Briet-Wigner Formula – Compound Nucleus – Resonance Theory – Optical Model – Shell Model – Liquid Drop Model – Collective Model.

UNIT IV: ACCELERATORS AND REACTORS

Cyclotron – Synchrocyclotron – Betatron Synchrotron – Linear Accelerators – Characteristic of Fission – Mass Distribution of Fragments – Radioactive Decay Process –Fission Cross Section – Energy in Fission – Bohr-Wheeler’s Theory of Nuclear Fission – Fission Reactors – Thermal Reactors – Homogeneous – Reactor – Heterogeneous Reactors – Basic Fusion Processes – Characteristic of Fusion – Solar Fusion – Controlled Fusion Reactors. [EMPLOYABILITY]

UNIT V: ELEMENTARY PARTICLES

Building Block of Nucleus – Nucleons, Leptons, Mesons, Baryons, Hyperons, Hadrons, Strange Particles – Classification of Fundamental Forces and Elementary Particles – Basic Conservation Laws – Additional Conservation Laws: Baryonic, Leptonic, Strangeness and Isospin Charges/Quantum Numbers – Gell-Mann-Nishijima Formula – Multiplets – Invariance Under Time Reversal (T) Charge Conjugation (C) and Parity (P) – TCP Theorem – Parity Non-conservation in Weak Interactions – CP Violation –

Eight-Fold Way and Supermultiple – SU(3) Symmetry and quark model – Basic Ideas on the Theories of Weak and Strong Interaction.

Book for Reference:

1. Nuclear Physics, an Introduction by S.B. Patel – (Wily –Eastern, New Delhi).
2. Concepts of Nuclear Physics by B.L. Cohen – (Tata McGraw Hill, New Delhi).
3. Introduction to Elementary Particles by D. Griffiths – (Wily International, New York).

Course Code	CORE PRACTICAL – III ADVANCED ELECTRONICS LAB	L	T	P	C
20213SEC33L		0	0	4	3

Aim:

- Verification of characteristics and applications of electronic components and devices.

(Any 12 from the following)

1. Logic gates – Universality of NAND/NOR gates using IC's.
2. Verification of Demorgans theorems and Boolean Expressions.
3. Astable and bistable and monostable multivibrator using IC 555.
4. Wein's bridge oscillator using IC 741.
5. Construction of dual regulated power supply.
6. Half and Full wave precision rectifier using IC 741.
7. Study of the characteristics of Load cell.
8. Digital to analog converter – R-2R method and weighted method.
9. Study the function of multiplexer and demultiplexer.
10. Study the function of decoder and encoder.
11. Flip flops.
12. Half adder and Full adder (using only NAND gates).
13. Half subtractor and Full subtractor (using only NAND gates).
14. Digital comparator using XOR and NAND gates.
15. Study of counter using IC 7490 (0 - 9).
16. Analog to digital converters – Born approximation method.
17. Calibration of thermistor.
18. Study of the characteristics of Strain gauge.

Course Code	DISCIPLINE SPECIFIC ELECTIVE COURSE-III NON CONVENTIONAL ENERGY PHYSICS	L	T	P	C
20213DSC34A		5	0	0	4

Aim:

- To learn about geothermal energy, energy from oceans and hydrogen and its applications.

UNIT – I: GEOTHERMAL ENERGY

Geothermal Energy – Nature of geothermal fields – Geothermal sources – Hydrothermal resources – Vapour Dominated systems – Liquid dominated systems – Geopressed resources – Hot dry rock resources – Magma resources – Advantages and disadvantages – applications of geothermal energy.

UNIT –II: ENERGY FROM OCEANS

Ocean thermal electric conversion – Open cycle OTEC system – closed cycle OTEC system – Energy from tides – Principle of tidal power – Components of tidal plants – operation methods of utilization of tidal energy – wave energy conversion by floats – High level reservoir wave machine – The Dolphin type wave power machine – Estimate of energy and power in Tidal system – Advantages and Limitations of Tidal power generation.

UNIT –III: HYDROGEN ENERGY

Introduction to Hydrogen energy – Properties of Hydrogen – Hydrogen production – Electrolytic production – tank type electrolyzer – Fossil field methods – Coal gasification for the production of Hydrogen – Coal gasification plants – Solar energy methods - Hydrogen Transportation – Safty rules in handling Hydrogen fuel – Hydrogen storage. [EMPLOYABILITY]

UNIT – IV: MHD POWER

Magneto hydro dynamic power generation (MHD) – Principles of MHD power generation – MHS systems – open cycle systems – closed cycle systems – Liquid metal system – Advantages of MHD.

UNIT – V: ENERGY CONSERVATION

Economic concept of energy – Principles of energy conservation and energy Audit – Different types of Audit – Co-Generation – types of Co-generation – Heat Recuperators – Uses of heat recuperators – Heat generators.

Books for Study:

1. Non- Conventional Energy Sources – G.D. Rai, Kannah Publication.

Course Code	Course Title	L	T	P	C
20213DSC34B	Fluid Mechanics	5	0	0	4

Fundamentals of Dynamics : Review of vector algebra and differential calculus of vectors: gradient, divergence and curl. Reference frames. Inertial frames; Review of Newton's Laws of Motion. Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse. Momentum of variable-mass system: motion of rocket.

Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Force as the gradient of potential energy. Work & Potential energy. Elastic potential energy. Law of Conservation of Energy with an example of a spring-mass system. Work done by nonconservative forces (with an example of damped oscillations). Energy diagram. Stable and unstable equilibrium.

Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.

Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Determination of Rigidity modulus:- Torsional pendulum and Searle's method.

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. [EMPLOYABILITY]

TEXT BOOKS

- Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
- Fundamentals-of-Physics-I-Mechanics, R. Shankar, 2014, Yale University Press
- An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
- Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
- Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.

Course Code	Course Title	L	T	P	C
20213DSC34C	Electromagnetic Induction	5	0	0	4

Electrostatic energy: System of charges, Charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Network theorems: Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.

Ballistic Galvanometer: Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.
[EMPLOYABILITY]

TEXT BOOKS

1. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 2012, Pearson Prentice Hall.
2. Electricity and Magnetism, Edward M. Purcell, 2017, McGraw-Hill Education
3. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
4. Fundamentals of Physics Vol. II, R. Shankar, Yale University Press, 2016

Course Code	Course Title	L	T	P	C
20213DSC34D	Waves and Optics	5	0	0	4

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves

Velocity of Waves: Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Newton's Formula for Velocity of Sound. Laplace's Correction.

Superposition of Harmonic Waves: Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment.

Wave Optics: Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.

Interference: Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films.
[EMPLOYABILITY]

TEXT BOOKS

- Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
- Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
- Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.

Course Code	Thermal Physics	L	T	P	C
20213DSC34E		5	0	0	4

Real Gases: Deviations from the ideal gas equation, Virial equation, Andrew's experiments on CO₂ gas, critical constants, continuity of liquid and gaseous State, vapor and gas; Boyle temperature, Van der Waal's equation of state for real gases, values of critical constants, law of corresponding states, comparison with experimental curves, p-V diagrams,

Transport phenomenon in gases: Molecular collisions, mean free path, collision probability, estimates of mean free path, transport phenomenon in ideal gases: (1) viscosity, (2) thermal conductivity, and (3) diffusion. brownian motion and its significance.

Zeroth and First Law of Thermodynamics: Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form.

Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence.

Entropy: Concept of Entropy, Clausius Theorem, Clausius Inequality, second Law of Thermodynamics in terms of entropy, entropy of a perfect gas, principle of increase of entropy, entropy changes in reversible and irreversible processes with examples, entropy of the universe, entropy changes in reversible and irreversible processes, principle of increase of entropy, third law of thermodynamics. unattainability of absolute zero.
[EMPLOYABILITY]

TEXT BOOKS

- Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
- A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press
- Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill

Course Code	GENERAL ELECTIVE COURSE WRITING FOR THE MEDIA	L	T	P	C
20213GEC35		4	0	0	2

Aim:

- To equip students to enter into the realm of mass media.

Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop-Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

References-

Journalism	-Susan
Professional Journalism	-John Hogenberg
News Writing and Reporting	-M.James Neal (Surjeet Publication)
Professional Journalism	-M.V Komath
The Journalist's Handbook	-M.V Komath
Mass Communication & Journalism	-D.S Mehta,

Course Code	Course Title	L	T	P	C
20213GEC35	General Elective Course Applicable Mathematical Techniques	4	0	0	2

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman

Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	GENERAL ELECTIVE COURSE-III GREEN CHEMISTRY	L	T	P	C
20213GEC35		4	0	0	2

Objectives: To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollutionPollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentationAntibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Trends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

Outcomes:

- To understand the environmental status and evolution.

- To know about the Pollution and its prevention measures.
- To familiarize the green chemistry.
- To learn about the bio-catalytic reactions.
- To understand about the vitamins and antibiotics.

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnesand
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	GENERAL ELECTIVE COURSE-III BIOANALYTICAL TECHNIQUES	L	T	P	C
20213GEC35		4	0	0	2

Unit I

Separation techniques – Solvent extraction – principles and applications of soxhlet extraction and super critical fluid extraction; Distillation – Theory of distillation, method and application of fractional and steam distillation; Techniques of sublimation and its applications.

Electrochemical techniques – Standard hydrogen electrode, pH measurements; Buffers in biological systems; Henderson-Hassel balch equation. Principle and application of oxygen electrode; Potentiometric titrations of oxidation-reduction reactions.

Unit II

Chromatography – Principles, materials, techniques and applications of Paper chromatography, TLC, Column chromatography, Gel permeation chromatography, Ion-exchange chromatography, Affinity chromatography, HPLC and GLC .

Unit III

Centrifugation – Types of centrifuges; Preparative ultracentrifuges – Principles, techniques and applications of differential and density gradient centrifugation; Principles, instrumentation and applications of analytical ultracentrifuges. Radioisotopes – Radioactivity, types, law of radioactivity, decay processes, units of radioactivity; Applications of radioisotopes in biology.

Unit IV

Electrophoresis – Principles, instrumentations and biological applications of Paper, Cellulose acetate, agar gel, PAGE, SDS-PAGE, immuno and isoelectric focusing electrophoresis. Blotting techniques – Principles, materials, methods and applications of Southern, Northern and Western blotting techniques.

Unit V

Spectroscopy – Principles and components of instruments and applications of Colorimeter, Spectrophotometer, Fluorescence spectrometry, AAS and Flame photometer. Principles and applications of Raman spectroscopy, IR spectrometry, NMR and ESR.

References:

1. Biophysical Chemistry – Nirmalendu nath
2. Biophysical Chemistry – Upadhyay, Upadhyay and nath.
3. Principles and techniques of practical Biochemistry – Keith Wilson and Walker.
4. Principles of Instrumental analysis – B.K.Sharma.
5. Instrumental analysis – Chatwall Anand

Course Code	General Elective Course	L	T	P	C
20213GEC35	Internet and Web Design	4	0	0	2

Aim

To equip the students with basic programming skill in Web Designing

Objective

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

UNIT I

Introduction to the Internet – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms.

Outcomes:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

Reference Book

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	General Elective Course	L	T	P	C
20213GEC35	Insurance Services	4	0	0	2

Aim:

- To look after the interests of people from uncertainty by providing certainty of compensation.

Objectives:

- To learn the fundamental concepts and principles of insurance.
- To explain the nature of different insurance policies, insurance contracts and settlement of claims.

Out Come:

- The course helped the students to learn the principles of Insurance and the functions of Life and general insurances and the IRDA

UNIT – I

Insurance and Assurance – Importance of Insurance – Functions of Insurance – Insurance contract and their Elements – Fundamental Principles of Insurance contracts

UNIT – II

Types of Insurance contracts – Differences between Life and General Insurance – Concepts in Insurance - Insurer, Insured, Premiums and Claims – Reinsurance – Double Insurance

UNIT – III

Life Insurance – Advantages of Life Insurance – Procedure for Effective Life Insurance – Risk Factors in Life Insurance – Procedure for Settlement of Life Insurance Claims – Different kinds of Life Insurance Policies including Endowment and whole Life Policies.

UNIT – IV

General Insurance – Fire Insurance – Contract of Fire Insurance – Fire Policy Conditions – Subject matter of Fire Insurance – Fire Policy – Marine Insurance – Motor, burglary and Personal Accident Insurance.

UNIT – V

Reforms in Insurance Sector – principles and Types – I.R.D.A., Privatisation of Insurance – Insurance and Employment – Insurance Agents and career Agents – Investments by Insurance companies in housing sector and other infrastructure projects.

Reference Books:

Dr.MR.Mishra – Law of Insurance – Central Law Agency Allahabad

Dr.M.M.Verma & R.K.Agarwal – Insurance

Pandy & Ratogi – Insurance

M.N.Mishra & S.Chand - Principles and Practice of Insurance

Course Code	General Elective Course	L	T	P	C
20213GEC35	Counselling Psychology	4	0	0	2

Aim:

- To acquaint with counselling and its process

Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Out Come:

- Learn counselling and its process

UNIT I

Definition of Counselling

Counselling as a Solution to Human Problems

Counselling-Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates

Social Determinates

UNIT III

Approaches to Counselling

Counselling Process

UNIT IV

Psychological Testing

Diagnosis

UNIT V

Educational Counselling

Family Counselling

References Book:

1. Hanson, J.C. Stevic, R.R., Warner, R.W., Jr. Counselling Theory & Process (2nd Edition) Boston
2. Hurlock Elizabeth B.(2007), Human Development, New York, Grawhill Book Company
3. John W, Santrock (1999), Life Span Development, 7th Edition, New Delhi; Mcgrowhill Company
4. blum And Bolimsky, B. Counselling & Psychology; Bomboy; Asia Publishing House, 1961
5. Bordin, E.S. Psychology Of Counselling New York; Application Century Crafts, 1968
6. Lewis E. C., The Psychology Of Counselling New York Holt, Rinchart And Winston Inc. 1970

Course Code	CORE PAPER – IX PROGRAMMING IN C++	L	T	P	C
20213SEC41		6	0	0	5

Aim:

- To develop programming skills of C & C++ programming in solving some mathematical problems and their applications.

UNIT – I: PRINCIPALS OF OBJECTS ORIENTED PROGRAMMING (OOP)

Software evolution – object oriented programming paradigm – basic concepts of OOP’s – benefits of OOP’s – Introduction to C++ - token’s keywords – identifiers, variables, operators, manipulators, expression.

UNIT – II: CONTROL STATEMENTS & FUNCTIONS

Control structures in C++ - Functions in C++ - main functions – function prototyping – call by reference – return by reference – functions over loading – friend and virtual functions.

UNIT – III: CLASSES AND OBJECTS

Specification of a class – Accessing class members – member functions of class – objects – array of objects – passing objects as Function arguments – Friend functions – Const Member functions – Special member functions constructors – Destructors Operator overloading – overloading operators – Rules for overloading operators – Type conversions.

UNIT – IV: INHERITANCE

Single inheritance – multilevel inheritance – multiple inheritance – hierarchical inheritance – hybrid inheritance pointers – virtual function and polymorphism managing console I/O operations working with files – Classes for file stream operations – opening and closing a file – eof-of-file, deduction – file pointers updating a file error handling during file operations – Command line arguments.

UNIT – V: PROGRAMS

1. Arranging words in alphabetical order
2. Picking largest and smallest of a set of numbers
3. Solving quadratic equation
4. Multiplication of two square matrices
5. Least square curve fitting

6. Programs for handling files
7. To solve simultaneous equation by Gauss elimination method
8. Write a program to convert a number given in base to other bases and number to words
9. Write functions for (i) find the length of the string (ii) to find a substring with a given string
10. Write functions for (i) reversing the string (ii) converting integer into string
11. Write functions for (i) string copy (ii) string compare (iii) to replace a substring with another string
12. Read in a string of characters and determine if they are palindrome (i) to replace the half with first half (ii) reverse them half separately.

[SKILL DEVELOPMENT]

Text Book:

E. Balagurusamy – Objects Oriented Programming with C++, Tata McGraw Hill Publishing Company.

Course Code	CORE PRACTICAL – IV MICROPROCESSORS AND COMPUTER LABORATORY	L	T	P	C
20213SEC42L		0	0	5	5

Aim:

- To develop programming skills of microprocessor and C++ programming in solving some mathematical problems and their applications.

(Any 12 experiments only, minimum 6 from each section)

SECTION A

1. 8 bit addition, subtraction, multiplication and division using 4085.
2. 16 bit addition, 2's complement and 1's complement subtraction (4086/4088).
3. Conversion from decimal to octal and hexa systems.
4. Conversion from octal, hexa to decimal systems.
5. Study of seven segment display add on board.
6. Study of ADC interfacing (DAV 0900)
7. Traffic control system using microprocessor.
8. Microprocessor as digital clock.
9. Generation of square, triangular, saw-tooth staircase and sine waves using DAC 0400.
10. Control of stepper motor using microprocessor.

SECTION B

1. Roots of algebraic equations – Newton-Raphson method.
2. Least-square curve fitting-Straight line fit.
3. Solution of simultaneous linear algebraic equations – Gauss elimination method.
4. Solution of simultaneous linear algebraic equations – Gauss Seidal method.
5. Interpolation – Lagrange method.
6. Numerical integration – Composite trapezoidal rule.
7. Numerical integration – Composite Simpson's rule.
8. Numerical differentiation – Euler method.
9. Solution of ordinary differential equations – Runge – Kutta 2nd order method.
10. Solution of ordinary differential equations – Runge – Kutta 4th order method.

Course Code	DISCIPLINE SPECIFIC ELECTIVE COURSE-IV	L	T	P	C
20213DSC43A	NANO SCIENCE AND TECHNOLOGY	5	0	0	4

Aim:

- To learn the structures, properties, characterization and applications of nanomaterials.

UNIT – I: NANO POWDERS AND NANO MATERIALS

Preparation – Plasma arcing chemical vapour deposition – Sol–gel Technique – Silica gels – Hydrolysis – Condensation and Polymerization of monomer to form particles – Zirconia and yttrium gels – Aluminosilicate gels – Forming nanostructured surfaces using the sol – gel process – Trapping by Sol – gel Electrodeposition –High power magnets – Motors vehicles and aircraft – Medical Implants – Other medical uses.

UNIT – II: MOLECULAR NANOTECHNOLOGY TOOLS

Atoms by inference Electron microscope – Scanning electron microscope – Modern transmission electron microscopes – Scanning probe microscopy – Atomic force microscope – Scanning tunneling microscope – Nanomanipulator – Nanotweezers – Atom manipulation – Nanodots.

UNIT – III: THE CARBON AGE AND NANO BIOMATERIALS

New forms of carbon – Types of nanotubes – Formation of nanotubes – Methods and reactants – Arcing in the presence of cobalt – Laser methods – Chemical vapour deposition method – ballmilling – other methods – Assemblies –Uses of nanotubes – Electronics – hydrogen storage – Materials – Mechanical machines – Space elevators.

UNIT-II: OPTICS, PHOTONICS AND SOLAR ENERGY

Properties of light and nanotechnology – Reflectance of light – Transmission of light – Polarization of Radiation – Interaction of light and nanotechnology – Photon trapping and plasmas – Dielectric constant and polarization - Optically use full nanostructured polymers – Polymeric crystals, surface wave guides and control of light paths.

[SKILL DEVELOPMENT]

UNIT – V: NANOELECTRONICS & FUTURE APPLICATION

The tools of micro and nanofabrication – Optical lithography – electron beam lithography – Atomic lithography – molecular beam epitaxy – Quantum electronics devices – High electron mobility transistors – Quantum interface transistors –Nano electronics and magnetic devices – new computing systems – Optoelectronics devices – Light emitting diodes – Thermionic solar power –Environmental applications.

Books for Study:

Mick Wilson, K.K Geroff Smith, Michelle and Bukhard Raguse, Nano technology –Basic science and Emerging technologies, Overseas press 2005.

Course Code	Course Title	L	T	P	C
20213DSC44B	Analog Systems and Applications	5	0	0	4

Introduction to CRO: Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.

Semiconductor Diodes: P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance.

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β Relations between α and β . Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.

Amplifiers: Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains.

Sinusoidal Oscillators: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators.

[SKILL DEVELOPMENT]

TEXT BOOKS

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
- Solid State Electronic Devices, B.G.Streetman & S.K.Banerjee, 6th Edn.,2009, PHI Learning.

Course Code	Course Title	L	T	P	C
20213DSC44C	Elements of Modern Physics	5	0	0	4

Solution of Schrodinger equation for one dimensional problems: One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as example; Quantum mechanical scattering and tunnelling in one dimension-across a step potential & rectangular potential barrier.

Lasers: Einstein's A and B coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three- Level and Four-Level Lasers. Ruby Laser and He-Ne Laser.

Nuclear models: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid Drop model: semi-empirical mass formula and binding energy, Nuclear Shell Model and magic numbers.

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.

Fission and fusion: mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions).

[SKILL DEVELOPMENT]

TEXT BOOKS

- Quantum Mechanics, Robert Eisberg and Robert Resnick, 2nd Edn., 2002, Wiley.
- Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
- Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
- Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.

Course Code	Course Title	L	T	P	C
20213DSC44D	Digital Systems and Applications	5	0	0	4

Timers: (a) IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator.

Shift registers: (a) Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in- Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits): (a) Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

Computer Organization: (a) Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map

Introduction to Assembly Language: 1 byte, 2 byte & 3 byte instructions. **Conversion:** Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation)

[SKILL DEVELOPMENT]

TEXT BOOKS

- Digital Fundamentals, 11/e Thomas L. Floyd, 2015, Pearson.
- Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., 2011, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

Course Code	Experimental Techniques	L	T	P	C
20213DSC43E		5	0	0	4

Measurements: Accuracy and precision. Significant figures. Error and uncertainty analysis. Types of errors: Gross error, systematic error, random error. Statistical analysis of data (Arithmetic mean, deviation from mean, average deviation, standard deviation, chi-square) and curve fitting. Gaussian distribution.

Signals and Systems: Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first and second order systems. Fluctuations and Noise in measurement system. S/N ratio and Noise figure. Noise in frequency domain. Sources of Noise: Inherent fluctuations, Thermal noise, Shot noise, 1/f noise.

Shielding and Grounding: Methods of safety grounding. Energy coupling. Grounding. Shielding: Electrostatic shielding. Electromagnetic Interference.

Digital Multimeter: Comparison of analog and digital instruments. Block diagram of digital multimeter, principle of measurement of I, V, C. Accuracy and resolution of measurement

Impedance Bridges and Q-meter: Block diagram and working principles of RLC bridge. Q-meter and its working operation. Digital LCR bridge.

[SKILL DEVELOPMENT]

TEXT BOOKS

- Electronic circuits: Handbook of design and applications, U. Tietze and C. Schenk, 2008, Springer
- Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1990, Mc- Graw Hill
- Measurement, Instrumentation and Experiment Design in Physics & Engineering, M. Sayer and A. Mansingh, 2005, PHI Learning.

Employability/Entrepreneurship and Skill Development



PRIST
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THANJAVUR – 613 403 - TAMILNADU

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY
CURRICULUM

FULL TIME

[Regulation 2020]

[Candidates admitted from the academic year 2020-2021 onwards]

Academic Year 2021-2022

Skill development	
Employability/Entrepreneurship/Skill development	
Employability	
Entrepreneurship	
Employability/ Entrepreneurship	



SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY- REGULATION 2020

COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tami – I/Advanced English-I/Hindi-I/ French - I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20115AEC13	Biomolecules	6	1	0	5
20114AEC14	Chemistry –I	6	1	0	4
PRACTICAL					
20115AEC15L	Biomolecules Lab-I	0	0	3	2
20114AEC16L	Volumetric Analysis Lab	0	0	3	2
	Total	20	2	6	17
AUDIT COURSE					
201LSCIC	Indian Constitution	-	-	-	2
201LSCUV	Universal Human Values	-	-	-	2

SEMESTER – II

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Tamil – II/ Advanced English-II/Hindi-II/ French – II	4	0	0	2
20111AEC22	English-II	4	0	0	2
20115AEC23	Biochemical Techniques	6	1	0	5
20114AEC24	Chemistry – II	6	1	0	4
PRACTICAL					
20115AEC25L	Biochemical Techniques Lab-I	0	0	3	2
20114AEC26L	Organic Analysis Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20115RLC27	Research Led Seminar	-	-	-	1
	Total	20	2	6	18
AUDIT COURSES					
201ACLSCOS	Communication Skills	-	-	-	2
201ACSSBBE	Basic Behavioral Etiquette	-	-	-	2

SEMESTER – III

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20132AEC31/ 20111AEC31/ 20135AEC31	Tamil – III/Hindi-III/Advanced English-III/ French – III	4	0	0	2

20111AEC32	English-III	4	0	0	2
20115AEC33	Cell Biology and Genetics	4	1	0	4
20120AEC34	Programming in C	4	1	0	5
PRACTICAL					
20115AEC35L	Cell Biology and Genetics Lab	0	0	3	2
20120AEC36L	Programming in C Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20115RMC37	Research Methodology	2	0	0	2
	Total	18	2	6	19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2

SEMESTER – IV

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Tamil-IV/Advanced English-IV /Hindi-IV/ French – IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20115AEC43	Human Physiology	4	1	0	4
20120AEC44	Fundamentals of Computing	5	1	0	5
201ENSTU45	Environmental studies	2	0	0	2
PRACTICAL					
20115AEC46L	Biochemical Techniques Lab-II	0	0	3	2
20120AEC47L	Web Design Lab	0	0	3	2
	Total	19	2	6	19
AUDIT COURSE					

201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	2

SEMESTER – V

Course Code	Course Title	L	T	P	C
THEORY					
20115AEC51	Enzymes	4	1	0	4
20115AEC52	Bioenergetics and Metabolism	4	1	0	3
20115AEC53	Immunology	4	1	0	4
20115DSC54__	Discipline Specific Elective -I	4	1	0	3
PRACTICAL					
20115AEC55L	Food and enzyme Analysis Lab	0	0	3	2
20115AEC56L	Immunology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20115BRC57	Participation in Bounded Research	-	-	-	1
Total		16	4	6	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	2

SEMESTER – VI

Course Code	Course Title	L	T	P	C
THEORY					
20115AEC61	Clinical Biochemistry	4	1	0	4
20115SEC62	Molecular Biology	4	1	0	5
20115DSC63_	Discipline Specific Elective -II	4	1	0	3

201—OEC (2 DIGIT COURSE Name)	Open Elective Course	4	0	0	2
PRACTICAL					
20115AEC64L	Hematology and clinical biochemistry Lab	0	0	3	2
20115SEC65L	Molecular Biology Lab	0	0	3	2
20115PRW66	Project Work	-	-	-	4
20115PROEE	Program Exit Examination	-	-	-	1
	Total	16	3	6	23
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2
201ACLSCET	Community Engagement	-	-	-	1
Total Credits -Programme					115
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 20115DSC54A – Pharmaceutical Biochemistry b) 20115DSC54B –Basic Biotechnology c) 20115 DSC56C - Evolutionary Biology d) 20115 DSC56D- Instrumental methods of analysis
	Discipline Specific Elective Courses-I
VI	a) 20115DSC63A- Biochemistry of plants and microbes b) 20115DSC63B – Hospital Managements c) 20115 DSC63C -Microbial technology d) 20115 DSC63D -Physiology and hormones e) 20115 DSC63E -Gene, Gene expression and regulation

Open Electives

Semester	Open Elective Courses
VI	a) 201TNOEC-Tamil Ilakkiya Varalaru b) 201ENOEC-Journalism c) 201MAOEC-Development of Mathematical Skills d) 201PHOEC-Instrumentation e) 201CEOEC-Food and Adulteration f) 201CSOEC – E-Learning g) 201CAOEC-Web Technology h) 201CMOEC-Banking service

Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	17	-	-	-	-	-	17
II	17	-	-	-	1	-	18
III	17	-	-	-	2	-	19
IV	17	-	-	-	-	2	19
V	15	-	3	-	1	-	19
VI	11	2	3	2	4	1	23
Total	94	2	6	2	8	3	115

Course Code	Course Title	L	T	P	C
17110AEC11	Tamil-I	4	0	0	2

முதலாம் ஆண்டு

இக்கால இலக்கியம் - செய்யுள், சிறுகதை, நாடகம், இலக்கிய வரலாறு

அலகு : 1. செய்யுள்

1. தாயுமானவ சுவாமிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்
2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்
3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்
4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்
5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள், தமிழ் இனிமை, தமிழ் உணவு

அலகு : 2. செய்யுள்:

6. நாமக்கல கவிஞர் - தமிழ் தேன் - தமிழ் வளர்க்க சபதம் செய்வோம், 40 அடிகள்
7. ந.பிச்சமூர்த்தி - வழித்துணை - கவிதை கருடன், 42 அடிகள்
8. சுரதா - தேன்மழை, கலப்பை, 22 அடிகள்
9. கண்ணதாசன் - இலக்கியம், ஒரு பானையின் கதை, 54 அடிகள்
10. அப்துல் ரகுமான் - சொந்த சிறகுகள், குப்பையை கிளறும் சிறகுகள், 80 அடிகள்

அலகு : 3. சிறுகதை:

11. சு.சமுத்திரம் - வேரில் பழுத்த பலா

அலகு : 4. நாடகம்:

12. கு. வெ. பாலசுப்பிரமணியன், கௌதம புத்தர் (உரைநடை நாடகம்)

அலகு : 5. இலக்கிய வரலாறு

13. சிறுகதை, புதினம், நாடகம் உரைநடை, கவிதை, புதுக்கவிதை

***Employability**

Course Code	Course Title	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Course Objective:

- To familiarize with the glossary terms, figures of speech
- To enhance vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Course Outcome:

- Develop vocabulary
- Learn to edit and do proof reading
- Read and comprehend literature

UNIT – I

Glossary of grammar terms, Figures of speech

UNIT – II

Foreign words and phrases, British and American Vocabulary

UNIT – III

Comparison and contrast, Cause and effect

UNIT – IV

Editing , Proof reading

UNIT – V

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

Reference book:

Author	Title of the book	Edition / Year	Publisher
Wren and Martin	English Grammar	2009	S.Chand& Company Ltd
Meenakshi Raman & Sangeetha Sharma	Technical Communication	Second Edition 2011	Oxford University Press
Sudhir Kumar Sharma	The World's Great Speeches	-	Galaxy Publishers

***Skill Development**

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature
- Appreciate the different types of poetry and prose

UNIT –I

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT – II

Enterprise -Nissim Ezekiel

Love poem for a wife -A.KRamanujam

UNIT –III

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -ArunaGnanadason

UNIT –IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –V

Oliver Twist -Charles Dickens

Text book:

Author	Title of the book	Edition / Year	Publisher
S.Murugesan/Dr.K.Chellappa n	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

***Skill Development**

Course Code	Course Title	L	T	P	C
20115AEC13	Biomolecules	6	1	0	5

Aim

- To know the various biomolecules present in biological system

Course objectives

- To understand the properties and importance of water in biological system
- To introduce the importance of vitamins in human body

Course outcomes (CO's)

- Recognize water as a universal solvent and elixir of life by knowing its importance
- Identify the properties and classification of carbohydrates
- Recall the role of various lipids in biomembrane including signal transduction
- Categories the amino acids and know their properties
- Differentiate the structure, properties and functions of DNA and RNA
- List the functions and deficiency disease of fat and water soluble vitamins

Unit I Carbohydrates:

Classification - structural elucidation of glucose and fructose. Interconversion of sugars. Structure, Properties and biological functions of mono, di, oligo and polysaccharides. Homoglycans and Heteroglycans.

Unit II Amino acids and protein:

Amino acid Structure, classification, physical and chemical properties. Peptides, peptide bond, peptide synthesis, biologically important peptides. Proteins: classification, physical and chemical properties, Biological importance. Primary structure, Secondary, tertiary and quaternary structure- forces stabilizing the structure of proteins.

Unit III Nucleic acids:

Components of mono nucleotides- pyrimidines, purines, nucleosides, nucleotide. 5'diphosphates and 5' triphosphates. Polynucleotides: DNA and RNA Composition, structure- and biological importance. Properties -hydrolysis of nucleic acids by acids, bases and enzymes. Denaturation and renaturation. Isolation, separation and purification of DNA and RNA

Unit IV Lipids:

Classification and Biological significance. Simple lipids: types of fatty acids, triglycerides, waxes. Compound lipids-structure and functions- Phospholipids, sphingolipids and

glycolipids. Lipoproteins- classification and composition. Steroids and prostaglandins- structure and functions. Characterization of oils: Reichert-Meisel value, Iodine number, saponification value, acid number and determination of acetyl value.

Unit V Vitamins and Antibiotics:

Definition and classification. Source, Structure and biological role, daily requirement and deficiency manifestation of the fat soluble vitamins A,D,E & K. Water soluble vitamins- Ascorbic acid, thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12. Antibiotics – Definition, types and general properties; Structure and significance of Penicillin and tetracycline

REFERENCE BOOKS:

1. Principles of Biochemistry – 7th edition Lehninger, Nelson Cox Macmillan worth Publishers, 2013.
2. Textbook of Biochemistry-West & Todd.4th edition, Macmillan, 1966.
3. Harper’s Biochemistry 29th edition, McGraw Hill, 2012.
4. Fundamentals of Biochemistry –.11th edition Agarwal O.P., Goel Publishing House, 2008.
5. Essentials of Biochemistry –2nd edition A.I. Jain. S. Chand publications, 2004.
6. Chemistry of Biomolecules, S. P. Bhutani, 2010.
7. Fundamentals of biochemistry, J.L. Jain, 2005.
8. Introductory Experiments on Biomolecules and their Interactions, Robert K. 2015.
9. Biochemistry – Stryer

***Employability/**

Course Code	Course Title	L	T	P	C
20114AEC14	Chemistry - I	6	1	0	4

Aim

The behavior of, and interactions between, matter and energy at both the atomic and molecular levels.

Course Objective

- Use standardized names and symbols to represent atoms, molecules, ions and Chemical reactions.
- Predict atomic structure, chemical bonding or molecular geometry based on Accepted models.

Course Outcome:

1. Apply quantitative reasoning skills to matter and energy, and physical or chemical changes that occur.
2. Use accepted models to describe the reactions between acids and basis and basic equilibrium concepts. Demonstrate competence in collecting and interpreting data in the laboratory.

UNIT- I

Polar effect:

Inductive effect +I and – I groups, relative strength of – foamic , acetic and propionicacids – acetic and chloroacetic acids – ammonia and methyl amine. Resonance – resonating structure of benzene , butadiene and COOH groups – conditions – applications (resonance energy and stability). Acidic & basic properties of phenol & aniline. Hyperconjugation.- consequence of hyperconjugation. Steric effects –Steric accelerated reaction and steric inhibited reaction.

UNIT –II

Industrial chemistry

Fuel gases – Watergas, products gas, L.P.G gas, Gobar gas and natural gas. Fertilizers – NPK and mixed fertilizers, micronutrients, and their role in plant life and biofertilizers, soap and detergents an elementary idea about preparation cleaning action of soap detergents.

UNIT III

Aromatic compounds : structure, stability, resonance and aromaticity of benzene. Substitution reactions, Nitration, Halogenation and Alkylation Naphthalene Isolation, Synthesis, properties, and structural elucidation and uses .Organic compounds: Benzoin, Perkin, Cannizaro, Claisen reactions. Chemotherapy: Definition and uses of Antibiotic,

Analgesic Antibacteria, Antiviral, Antidiabetic, Antihypertensive, Antiseptic and disinfectant, Antimalarial- Anaesthetics – local and general.

UNIT –IV

Energetic: Review first law of thermodynamic state and path functions need for the second law Carnot cycle and thermodynamic scale of temperature spontaneous and non spontaneous process and Third law.

UNIT – V

Chemical kinetics: Order of reactions and their determinations. Activation energy, effect of temperature on reaction rate. Catalysis Types, mechanism of catalytic reactions, industrial applications.

Reference:

1. R.D.Madan, J.S.Tiwari and G.L.Mudhara, A Text Book of First Year B.Sc. Chemistry, S . hand & Co.
2. G.S. Manku, Theoretical Principles of Inorganic chemistry, Tata Mcgraw Hill, New Delhi.
3. Paula Yaukanis Bruice – Organic chemistry, prentice Hall.
4. J.D.Lee, concise inorganic chemistry, 5th Edition, Blackwell Science Ltd, Oxford, 2002.
5. B.S.Bahl and Arun Bahl, Advanced Organic chemistry, S.Chand and Co., NewDelhi
6. B.R.Puri and Sharma, principles of physical chemistry.
7. K.S.Tiwari, N.K.Vishnoi and S. N. Mehrotra, A Text book of Organic chemistry, Vikas publishing House Pvt. Ltd., NewDelhi, 2004.

***Skill Development**

Course Code	Course Title	L	T	P	C
20115AEC15L	Biomolecules Lab-I	0	0	3	2

Aim

- To know the safety measures to be followed in laboratory

Course Objectives

- To give hands on experience on the preparation of buffers and various solutions.
- To identify and separate the biomolecules
- To quantify the vitamin in a sample

Course outcomes (CO's)

1. Gain knowledge on lab safety
2. Trained on preparation of reagents and solution
3. Able to analyse biomolecules and vitamins qualitatively and quantitatively
4. Handle the instruments associated with the practical
5. To identify the structure of biomolecules

1. Qualitative Analysis of Carbohydrates:

(a) Glucose

(b) Fructose

(c) Xylose

(d) Maltose

(e) Lactose

(f) Sucrose.

2. Qualitative Analysis of Protein:

(a) Egg Albumin

(b) Egg Flakes

(c) Casein

3. Colour Reactions for Amino Acids.

4. Qualitative Analysis of Lipids.

5. Preparations:

(a) Starch from Potato.

(b) Casein from Milk.

References:

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer
4. Introductory Practical Biochemistry – S.K.Sawhney, Randhir Singh.

*Entrepreneurship

Course Code	Course Title	L	T	P	C
20114AEC16L	Volumetric Analysis Lab	0	0	3	2

Aim

- This course aims to familiarize students with the principles of volumetric analysis.

Course objective

- Experimental practice of quantitative volumetric analysis.
- The objective of the estimation of ferrous sulphate, oxalic acid, copper, potassium dichromate and potassium permanganate.
- The main objective of volumetric analysis is to determine the amount of a substance in a given sample.
- When dealing with volumetric analysis the concept of strong acid and base

Course Outcome

1. To understand the apparatus used in volumetric analysis and correct volumetric analysis.
2. To know Good laboratory practice

Experiments:

1. Strong Acid and Strong Base
2. Weak acid vs Strong base
3. Estimation of ferrous sulphate.
4. Estimation of oxalic acid.
5. Estimation of copper.
6. Estimation of potassium dichromate
7. Estimation of potassium permanganate

Reference:

1. Vogel A I, A Text Book of Quantitative Inorganic Analysis, 3 rd Edn., Longman Group

***Skill Development**

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

Aim:

The aim of the constitution is mentioned in the *preamble that is to constitute* India into a sovereign, socialist, democratic republic and it's the provision of the rights of citizens.it's primary objective is to provide economic, social & political justice.

Course Objectives:

- To make the students understand about the democratic rule and parliamentary administration
- To appreciate the salient features of the Indian constitution
- To know the fundamental rights and constitutional remedies
- To make familiar with powers and positions of the union executive ,union parliament and the supreme court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Course outcome:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights are established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

Unit I:The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

***Employability**

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.
- 3) Markandan. k.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practiced human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realize their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- ② Introduction: What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)

- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy, sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non-violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit IV

- Introduction: What is righteousness?
- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance
- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore

- Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self-restraint and Ways of overcoming greed. Renunciation with action as true renunciation
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

***Skill development**

SEMESTER II

Course Code	Course Title	L	T	P	C
20110AEC21	Tamil-II	4	0	0	2

முதலாம் ஆண்டு
செய்யுள் , பக்தி இலக்கியம், சிற்றிலக்கியம் , இலக்கிய வரலாறு

அலகு : 1. செய்யுள்:

1. திருநானசம்பந்தர் தேவாரம் - கோளறு பதிகம்
2. திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை
3. சுந்தரர் தேவாரம் - திருநொடித் தான் மலை
4. மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2. செய்யுள்:

5. குலசேகராழ்வார் - பெருமாள் திருமொழி
6. நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்
7. ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்
8. திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3. செய்யுள்:

9. திருமூலர் - மூன்றாம் திருமுறை
10. குமரகுருபரர் - மானாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்
11. திரிகூடராசப்பக்கவிராயர் - குற்றாலக்குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்
12. வீரமாமுனிவர் - திருக்காவலூர்க் கலம்பகம்

அலகு : 4. புதினம்

13. கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5. இலக்கிய வரலாறு

14. சைவ வைணவ இலக்கியங்கள், சிற்றிலக்கியங்கள், (பள்ளு - பிள்ளைத்தமிழ் , - பரணி)

***Employability**

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop technological skill
- Able to write in a variety of formats
- Read biographies and develop personality

UNIT – I

E-mail, Fax , Memos

UNIT – II

Itinerary, Checklist

UNIT – III

Invitation, Circular

UNIT – IV

Instruction , Recommendations

UNIT – V

Biographies of famous people: Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

Text Book

Author	Title of the book	Edition / Year	Publisher
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Rajendra Pal & J.S.Korlahalli	Business Communication	2015	Sultan

***Skill Development**

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Acquire language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology -A.K. Ramanujan

Gift -Alice Walker

The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans

Asleep -Ernst Jandl

Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas

I Have a Dream -Martin Luther king

Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe

The Fortune Teller -Karel Capek

Proposal -Anton Chekov

***Skill Development**

Text book:

Author	Title of the book	Edition / Year	Publisher
Gowri Sivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

Course Code	Course Title	L	T	P	C
20115AEC23	Biochemical Techniques	6	1	0	5

Aim

The course aims to provide an advanced understanding of the core principles and topics of Biochemistry

Course objectives

- To teach students on various techniques used for the assessment of various diseases and research studies.
- To teach the good laboratory practice required to execute the learned techniques.

Course outcomes (CO's)

- To learn various techniques and acquire the skills to use appropriate methods.
- To acquire the good laboratory practices.
- This skill based course will teach the students the various instrumentations that are used in the analytical laboratories.
- This course covers both fundamental and applications of the instruments that are routinely used for the characterization of biomolecules
- It trains the students in adopting various techniques in biological research.
- The units of this paper are crucial for implementation of research ideas at molecular level.

Unit I:

Colorimetry: Beer Lambert's Law, Light absorption and its transmittance, Absorption Spectroscopy - Principle, instrumentation and applications of colorimetry and UV-Vis spectrophotometer. Emission Spectroscopy – Spectrofluorimeter - Principle, instrumentation and applications. Flame photometry - principle and applications.

Electrochemical techniques – Standard hydrogen electrode, pH measurements; Buffers in biological systems; Henderson-Hassel balch equation. Principle and application of oxygen electrode; Potentiometric titrations of oxidation-reduction reactions.

Unit II:

Chromatography techniques: Principles, materials, techniques and applications of Paper chromatography, TLC, Column chromatography, Gel permeation chromatography, Ion-exchange chromatography, Affinity chromatography, HPLC and GLC.

Unit III:

Centrifugation: Types of centrifuges; Preparative ultracentrifuges – Principles, techniques and applications of differential and density gradient centrifugation; Principles, instrumentation and applications of analytical ultracentrifuges.

Unit IV:

Electrophoresis – Principles, instrumentations and biological applications of Paper, Cellulose acetate, agar gel, PAGE, SDS-PAGE, immuno and isoelectric focusing electrophoresis. Blotting techniques – Principles, materials, methods and applications of Southern, Northern and Western blotting techniques.

Unit V:

Radio isotopic techniques: Types of radioactive decay, rate of radioactive decay, decay constant, Units of radio activity, measurement of radioactivity based on ionization- GM counter and excitation- Scintillation counter. Autoradiography. Applications of radioisotopes in biology. Hazards of radioactivity.

REFERENCES:

1. Biophysical Chemistry – Nirmalendu nath
2. Biophysical Chemistry – Upadhyay, Upadhyay and nath.
3. Principles and techniques of practical Biochemistry – Keith Wilson and Walker.
4. Principles of Instrumental analysis – B.K.Sharma.
5. Instrumental analysis – Chatwall Anand
6. Analytical Biochemistry – Dr.P.Asoken

***Employability/Entrepreneurship/Skill Development**

Course Code	Course Title	L	T	P	C
20114AEC24	Chemistry –II	6	1	0	4

Aim

The behavior of, and interactions between, matter and energy at both the atomic and molecular levels.

Course Objective

- Use standardized names and symbols to represent atoms, molecules, ions and Chemical reactions.
- Predict atomic structure, chemical bonding or molecular geometry based on Accepted models.

Course Outcome:

- Apply quantitative reasoning skills to matter and energy, and physical or Chemical changes that occur.
- Use accepted models to describe the reactions between acids and basis and basic equilibrium concepts.
- Demonstrate competence in collecting and interpreting data in the laboratory.

UNIT – I

Amino acids and proteins

Aminoacids- Classification based on structure and essential and non - essential aminoacids – preparation and properties – peptides – (elementary treatment) proteins – Classification, based on physical properties and functions. Structure of proteins – primary and secondary (elementary treatment)

UNIT – II

Coordination chemistry

Nomenclature of mononuclear complexes – Werner sidgwick, and pauling’s theories – Chelation and its industrial importance to EDTA. Biological role of hemoglobin and chlorophyll Metallic bond Electron gas, pauling and band theories. Semiconductors intrinsic, n- type and p-type.

UNIT –III

Synthetic polymers:

Teflon, Alkyl and epoxy resins, poly esters – General treatment only. Heterocyclic compounds – Furan, Thiophene, pyrrole and pyridine – preparation and properties of pyridine and pyrrole – Quinoline and isoquinoline.

Stereoisomerism – lactic and tartaric acid – racemic mixture and resolution. Geometrical keto – enol tautomerism Meaning of E,Z,R,S,D,L, meso, (+),(-) in stereochemistry.

UNIT- IV

Electrochemistry: Specific and equivalent conductivities – their determination – Oswald's dilution law, Kohlrausch law. P^H and Buffer: Importance of pH and buffers in living systems – P^H determination by colorimetric and electrometric methods.

UNIT -V

Surface chemistry:

Emulsion, gels preparation, properties and applications. Electrophoresis, Chromatography – Column, paper and thin layer chromatography.

***Skill Development**

REFERENCES:

- 1.S.S.Dara – A Text Book of Environmental chemistry and pollution control- S.Chand and Co.
- 2.D.N.Bajpai – Advanced physical chemistry – S.Chand and Co.
- 3.Bruce H.Mahan, University chemistry – Narosa publishers, New Delhi, 1989.
- 4.R.T.Morrison and R.N.Boyd, organic chemistry, 6th Edition.
5. I.L.Finar, organic chemistry, Volume I
6. R.D.Madan, Advanced Inorganic chemistry.
- 7.Puri and Sharma, Text book of Physical chemistry.

Course Code	Course Title	L	T	P	C
20115AEC25L	Biochemical Technique Lab-I	0	0	3	2

Aim

To know the safety measures to be followed in laboratory

Course Objectives

- To know the safety measures to be followed in laboratory
- To give hands on experience on the preparation of buffers and various solutions.
- To identify and separate the biomolecules
- To quantify the vitamin in a sample

Course outcomes (CO's)

- Gain knowledge on lab safety
- Trained on preparation of reagents and solution
- Able to analyse biomolecules and vitamins qualitatively and quantitatively
- Handle the instruments associated with the practical
- Students will understand the concept of spectrophotometer
- They will be able to assess the suitability of chromatographic techniques for solving specific bio- analytical problems and critically apply the knowledge for biomolecules

EXPERIMENTS:

1. Estimation of Amino Acid (Glycine) by formal titration.
2. Estimation of Ascorbic Acid by using 2, 6- Dichloro phenol indophenols.
3. Determination of Acid Number of edible oil.
4. Estimation of reducing sugar by Benedict's method.
5. Determination of Saponification Number.
6. Estimation of RNA by Orcinol Method.
7. Estimation of DNA by Diphenyl amine method.

REFERENCES:

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer
4. Introductory Practical Biochemistry – S.K.Sawhney, Randhir Singh.

*Employability/Entrepreneurship

Course Code	Course Title	L	T	P	C
20114AEC26L	Organic Analysis Lab	0	0	3	2

AIM:

Aim of this course, students should be able to: Handle organic chemicals in a safe and competent manner

Course objective

- Comprehension of principles of elemental analysis and learning of current applications.
- The primary goal of this course is to make students aware of how chemical processes can be designed, developed and run in a sustainable way.
- Students acquire the competence to think of chemistry as a sustainable activity.

Course Outcome:

- Apply significant figures rules in all calculations providing the correct number of significant figures and units
- Convert between different units using conversion factors and dimensional analysis.
- Name elements, provide their symbols and determine the number of protons, neutrons, electrons and nuclei in elements and compounds,
- Calculate percent composition given a molecular formula and molecular formula given the percent composition.
- Name salt, acids, bases and covalent compounds and provide formulas for these given a molecular formula.
- Explain the difference between solubility and dissociation in water and apply this knowledge to acids, bases and salts.
- Identify weak and strong acids and bases and insoluble compounds using dissociation and solubility rules.
- Construct molecular, total and net ionic equations for double displacement reactions

EXPERIMENTS:

A study of elemental analysis of the following compounds:

- a. Carbohydrates,
- b. Amides,
- c. Aldehydes,
- d. Ketones,
- e. Acids,
- f. Phenols.

The students may be trained to perform the analysis like tests for elements (nitrogen only) aliphatic or aromatic saturated or unsaturated and functional groups present and record their observations.

REFERENCES:

1. Vogel A I, A Text Book of Quantitative Inorganic Analysis, 3 rd Edn., Longman Group.

***Skill Development**

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Aim:

The aim to develop communication skills

Course Objectives:

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome:

By the end of this program, participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text
 - ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing-
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
- Trends and opportunities in using digital technology in the workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. Power point

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to I Marketing

Unit VII

- Meaning of non-verbal communication
- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

***Skill Development**

Course Code	Course Title	L	T	P	C
201ACSSCBBE	Basic Behavioral Etiquette	-	-	-	2

Objectives:

Training is mainly focused on discipline, grooming, career planning and building personality. As it is the first year of the university, students are given awareness about the job market right from the start so that they prepare accordingly at their own pace and potential.

Eliminating negative thought, developing enriching habits, unlocking individual potentials and well versed communication is the aim of this program. The module consists of

- i) **Communication Skills**
- j) **Goal Setting**
- k) **Career Planning**
- l) **Reaching your Potential**
- m) **Time Management**
- n) **Stress Management**
- o) **Grooming and Discipline**
- p) **Learning skills**
- q) **Listening Skills**
- r) **Team Building**

***Skill Development**

SEMESTER – III

Course Code	Course Title	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

செய்யுள்

அலகு : 1

1. சிலப்பதிகாரம் - மனையறம் படுத்த காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3. சீவக சிந்தாமணி - விமலையார் இலம்பகம்

அலகு :2

4. பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
5. கம்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்

அலகு :3

6. சீறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
7. தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு :4

8. நளவெண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

9. காப்பியங்கள், ஐஞ்சிறு காப்பியங்கள், புராணங்கள், இதிகாசங்கள்

*Employability

Course Code	Course Title	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

To improve the knowledge of English

Course Objective:

To familiarize with the organs of speech and the description and classification of speech sounds

To understand consonant cluster, syllable, word accent and intonation.

To know how to interpret graphics

To write slogans and advertisements

Course Outcome:

Understand phonetics

Develop writing skill

Able to develop creative writing

UNIT –I

The organs of speech, Classification of speech sounds, Vowels and Diphthongs

UNIT –II

Consonants, Consonant cluster

UNIT – III

Syllable, Word accent, Intonation

UNIT – IV

Idiom, Interpretation of graphics

UNIT – V

Slogan writing, Writing advertisement

***Skill Development**

REFERENCE BOOKS:

Author	Title of the book	Edition / Year	Publisher
T.B. Balasubramanian	A text book of Phonetics for Indian Students	Reprint 2008	Macmillian
Meenakshi Sharma & Sangeetha Sharma	Technical Communication	2011	Oxford University Press

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Course Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Course Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – I

The Doctor's World	- R.K. Narayan
The Postmaster	- Rabindranath Tagore
Princess September	- E.Somerest Maugham

UNIT – II

The Price of Flowers	-Prabhat Kumar Mukhopadhyay
The Open Window	-Saki
The Model Millionaire	-Oscar Wilde

UNIT –III

My Brother My Brother	- Norah Burke
Uneasy Home Coming	- Will F. Jenkins
Resignation	- Premchand

UNIT –IV

The Referee	-W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds	-Farrell Mitchell

UNIT – V

The Dear Departed	-Stanley Houghton
The Princess and the Wood Cutter	-Alan Alexander Milne

Text book:

Author	Title of the book	Edition / Year	Publisher
SteuartH.King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One – Act Play		Emerald

***Skill Development**

Course Code	Course Title	L	T	P	C
20115AEC33	Cell Biology and Genetics	4	1	0	4

Aim

The aim of the course is to give basic knowledge about the structure and function of cells and cellular components.

Course objectives

- To know the tools required for studying cell morphology
- To enlight the students with structure and functions of various organelle
- To understand the cytoskeletal network and extracellular matrix
- To introduce the cell cycle, cell division and cell death process

Course outcomes (CO's)

- Differentiate the prokaryotic and eukaryotic cell
- Understand the principle behind studying the cell morphology using various microscope
- Identify the structure and functions of each organelle in cell
- Recognise the mechanism behind the protein sorting and transport to their destinations like lysosome, mitochondria and chloroplast
- Maintenance of cytoskeleton structure and function of micro, macro and intermediary filaments
- Identify the proteins involved in cell cell interaction
- Enumerate the phases of cell cycle, events in cell division and mechanism of cell death.

Unit I

An Overview of cells: Origin and evolution of cells. Cell theory, Classification of cells – Prokaryotic and Eukaryotic cells. Comparison of prokaryotic and eukaryotic cells. Cell Membrane – Fluid mosaic model of membrane structure and its composition. Cell cycle.

Unit II

Cytoplasmic organelles – Golgi bodies – Endoplasmic reticulum – Ribosomes – mitochondria – plastids – Lysosomes – micro bodies - peroxisomes – microfilaments – microtubules – centrosomes – Basal bodies -Cilia and flagella.

Unit III

Cell growth and division – Nucleus, Nucleolus, chromatin chromosomes – structure of DNA - cell cycle – division – mitosis – meiosis .

Unit IV

Genetics – Mendel's laws – Epistasis – Gene interaction - Lethal genes – inheritance of multiple genes - multiple alleles – structure of gene – gene mutation.

Unit V

Linkage and crossing over – mapping of chromosomes – Human cytogenetics – sex linked inheritance – sex differentiation and determination - Eugenics – Euphenics – population genetics.

REFERENCES:

1. Cell Biology – CB Powar
2. Cell Biology – Rastogi S.C.
3. Cell Biology – Verma and Agarwal
4. Genetics – Verma and Agarwal
5. Genetics – Strickberger

*Employability

Course Code	Course Title	L	T	P	C
20120AEC34	Programming in C	4	1	0	4

Aim

To equip the students with fundamental programming principles

Objective

- To learn the concept of programming
- To understand input and output functions
- To study about Structures
- To learn Pointers in C Language

UNIT I

Evolution and Applications of C – Structure of a C Program – Data Types –Declarations – Operators – Expressions – Type conversions – Built-in functions.

UNIT II

Data Input and Output – Control statements: IF, ELSE-IF, GOTO, SWITCH, WHILE-DO, DO-WHILE, FOR, BREAK and CONTINUE.

UNIT III

Functions: Defining and accessing functions-passing parameters of functions -Arguments – Recursive functions – Storage classes.

Arrays: Defining and processing Arrays – Multi dimensional arrays – passing arrays to functions – Arrays and strings – String functions – String Manipulations.

UNIT IV

Pointers:Pointers Declarations – Operations on pointers – pointers to functions – Pointer and Strings – pointers and arrays – array of pointers - Structures and pointers – unions.

UNIT V

Data files – Opening, Closing, and processing files – Files with structures and unions – Register variables – Bit wise Operations – Macros- Preprocessing

*Skill Development

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.

- Write and execute C programs for simple applications

TEXT BOOK:

“Programming in C” – E. Balagurusamy – Tata McGrawHill Publications

Book For Reference:

1. “ Programming with C” – Byron S.Gottfried – Schaum’s outline series – Tata McGrawHill publications.
2. “Let us C “ – Yeswant kanetkar – BPB Publications.

Course Code	Course Title	L	T	P	C
20115AEC35L	Cell Biology and Genetics Lab-I	0	0	3	2

Aim

To identify and isolate the enzymes , Proteins, vitamins etc.

Course Objective:

This practical course on proteins describes qualitative and quantitative analysis, as well as its purification and characterization.

Course outcomes (CO's):

- By the end of the course, students can be able to demonstrate the importance of the chromatography and their wide applications
- Understand and apply the principles and techniques of separation of pigments, amino acid and protein which prepares students for further education and/or employment in teaching, basic research, or the health professions.
- It trains the students in adopting various techniques in biological research.
- would be able to separate the plant pigments, identify and distinguish different amino acid, protein, lipids
- would be able to identify and outline the structure of an cell membranr at different magnification

EXPERIMENTS

1. Separation of Amino acids by Ascending, Descending, Circular & Two dimensional Paper Chromatography.
2. Extraction of Brain Lipids
3. Separation of Amino acids by TLC method.
4. Separation of Lipids by TLC.
5. Separation of Plant pigments by Column Chromatography.
6. Separation of Serum protein by Paper Electrophoresis.
7. Lipid Solubility of Membranes

*Employability

REFERENCES:

- 1 Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer
4. Introductory Practical Biochemistry – S.K.Sawhney, Randhir Singh.

Course Code	Course Title	L	T	P	C
20120AEC36L	Programming in C lab	0	0	3	2

Course Objectives:

- To make the student learn a programming language.
- To learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems.

Course Outcome

- To know the proper lines of C, Encapsulation, Inheritance and Polymorphism
- To explain the various data types, operations and functions of C
- To know the concept of constructors and destructors
- To explain the concept of inheritances, types of inheritance and polymorphism, virtual function
- To explain the types of streams, format and format of input and output operations.

Experiments

1. Write a C program to find the roots of Quadratic Equation (all cases).
2. Write a C program to find the Sum of Series (Sine, Cosine, e^x)
3. Write a C program to reads an integer N and determine whether N is prime or not.
4. Write a C program to Finding factorials, generating Fibnoacci Numbers using recursive functions
5. Write a C program to find the numbers in Ascending and Descending order (use it to find largest and smallest numbers).
6. Write a C program to find the sum of natural numbers using WHILE statement.
7. Write a C program for Sorting of given names in alphabetical order.
8. Write a C program for Matrix Operations (Addition, Subtraction, Multiplication – use functions).
9. Write a C program for String Manipulation without using String functions (String length, String Comparison, String Copy, Palindrome checking, counting words and lines in strings – use function pointers).

*Skill Development

REFERENCE

1. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman. P.V.P.Siddhartha Institute of Technology(Autonomous), I B.Tech. syllabus under PVP14 regulations

2. Programming in C by Pradip Dey, Manas Ghosh 2nd edition Oxford University Press.
3. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill
4. A first book of ANSI C by Gray J.Brosin 3rd edition Cengagedelmer Learning India P.Ltd
5. AL Kelly, Iraphol,Programming in C,4th edition Addison-Wesley – Professional
6. Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI

Course Code	Course Title	L	T	P	C
20120RMC37	Research Methodology	2	0	0	2

Aim:

To create a basic appreciation towards research process and awareness of various research publication

Course objectives:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

Course outcome:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computational frameworks used in mathematical researches.

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V:

B. Sc. (Life Sciences)

Basic Principles of Laboratory Life Sciences Laboratory

Introduction - Access to Laboratory and Emergency Exits - Basic Biostatistics, Mean, Median, Mode and its Application - Fundamental of Biosafety, Bioethics, Replication – Advantages and Disadvantages, Standard division, Standard Error, Preparation of Chemicals – Percentage, Molarity and Normality, Ratio Solution, PPM Solution etc. Ethical Issue in Animal Handling, Basic of DMRT, ANOVA etc.

*Employability

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Aim:

Course Objectives:

To provide an in-depth training in the use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with the internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of India
2. Microsoft Office 2007 Bible - John Walkenbach, Herb Tyson, Faithe Wempen, Cary N. Prague, Michael R. Groh, Peter G. Aitken, and Lisa A. Bucki - Wiley India Pvt. Ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

SEMESTER – IV

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தமிழ்.

செய்யுள் , சங்க இலக்கியம், அற இலக்கியம் , செம்மொழி , இலக்கிய வரலாறு

அலகு . 1 : பண்டைய இலக்கியம் - நற்றிணை;

1. நெய்தல் - தோழி கூற்று - பாடல் எண் . 11
2. குறிஞ்சி - தலைவி கூற்று - பாடல் எண் . 64
3. முல்லை - தலைவன் கூற்று - பாடல் எண் .142
4. பாலை - நற்றாய் கூற்று - பாடல் எண் . 29
5. மருதம் - தலைவி கூற்று - பாடல் எண் . 70

பண்டைய இலக்கியம் அறுந்தொகை

1. குறிஞ்சி - தோழி கூற்று - பாடல் எண் .1
2. முல்லை - செவிலித்தாய் கூற்று - பாடல் எண் .167
3. மருதம் - தலைவி கூற்று - பாடல் எண் . 181
4. நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290
5. பாலை - தலைவன் கூற்று - பாடல் எண் . 347

பண்டைய இலக்கியம் ஊங்குநூறு

1. மருதம் - கள்வன் பத்து - முதல் இரண்டு பாடல்கள்
2. நெய்தல் - தோழிக்குரைத்த பத்து - முதல் இரண்டு பாடல்கள்
3. குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்
4. பாலை - இளவேனிற் பத்து - முதல் இரண்டு பாடல்கள்
5. முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு . 2 : கவிந்தொகை

1. பாலை - பாடல் எண் . 2
2. குறிஞ்சி - பாடல் எண் . 37

அகநானூறு

1. பாலை - பாடல் எண் . 5
2. மருதம் - பாடல் எண் . 6

புறநானூறு

பாடல் எண் : 6 ,121, 41, 153 ,172 191, 223, 246, 284, 358.

பதிற்றுப்பத்து

இரண்டாம் பத்து பாடல் எண் . 4 (நிலம் நீர் வளி விசம்பு)

அலகு.3;

1. பட்டினப்பாலை - முதல் 105 வரிகள்
2. திருக்குறள் - 1.மருந்து 2.ஊக்கமுடைமை 3.உழவு

அலகு . 4 : செம்மொழி வரனறு ;

(மொழி - விளக்கம் , மொழிக்குடும்பங்கள், உலகச் செம்மொழிகள், இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள், வாழும் தமிழ் செம்மொழி, தொன்மை, தமிழின் சிறப்புகள், தமிழ் செம்மொழி நூல்கள்)

அலகு . 5 : இலக்கிய வரலாறு

சங்க இலக்கியங்கள் , பதினெண்கீழ்க்கணக்கு நூல்கள்.

***Employability**

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop writing skill
- Comprehend and describe poems
- Learn interviewing skills

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart, Proposals

UNIT – III

Discourse markers, Review

UNIT IV

Grammatical forms, Paraphrasing

UNIT –V

Definition, Writing for and against a topic.

***Skill Development**

REFERENCE BOOKS:

Author	Title of the book	Edition / Year	Publisher
Rajendra Pal &	Essentials of Business	2015	Sultan Chand & Sons

J.S Korlahalli	Communication		
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Wren & Martin	English Grammar & Composition	2009	S.Chand

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To learn English through literature

Course Objective:

- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Course Outcome:

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express one's views in writing

UNIT –I

My Last Duchess -Robert Browning

The Toys -Coventry Patmore

I, too -Langston Hughes

UNIT –II

How to be a Doctor -Stephen Leacock

My Visions for India -A.P.J. Abdul Kalam

Woman, not the weaker sex -M.K. Gandhi

UNIT –III

The Best Investment I ever made-A.J.Cronin

The Verger -W.S Maugham

A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth, As You Like It

UNIT –V

Henry IV, Tempest

***Skill Development**

Text book:

Author	Title of the book	Edition / Year	Publisher
Devaraj	English for Enrichment	2012	Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

Course Code	Course Title	L	T	P	C
20115AEC43	Human Physiology	4	1	0	4

Aim

Student would know about their own body system and its functions.

Course objectives

- Human Physiology aims to promote mechanistic advances in human integrative and translational physiology.
- Human Physiology provides a forum for many physiological areas.

Course outcomes (CO's)

- The purpose of this course is to promote knowledge in the integration of theories, methods and research in human physiology.
- It gives and exposure about human anatomy and physiology.
- Understand Anatomy & Physiology of various systems in Human which gives a clear picture about various systems and their respective disorders.
- Acquire good knowledge on Nervous & Muscular systems
- A Fair knowledge on Human Reproductive Biology provides information with the system, hormones involved, disorders associated with them in, and treatments in both genders respectively. 6. Understand "Anatomy & Physiology of various Systems such as Nervous system, Muscular system, Reproductive system, Liver.

Unit I Digestive system

Anatomy of digestive system, Types of digestion, salivary, gastric and biliary secretions-composition and its physiological role. Intestinal hormones. Movements in GIT. Digestion and absorption of carbohydrate, lipids & proteins. Digestion and absorption in small intestine.

Unit II Circulation

Respiratory system – Mechanism of respiration - Blood – Composition – Haemopoiesis – functions of cells – Haemoglobin – Blood coagulation – Lymph- composition and function - Heart - Cardiac cycle - ECG

Unit III Excretory system

Structure of kidney and Nephron, Composition and formation of urine, role of kidney in regulation of acid-base balance. Muscle: Kinds of muscle, structure, muscle proteins – functions – Mechanism of muscle contraction.

Unit IV Central Nervous system

Central nervous system- General organization. Functional units. Resting and action potential-conduction of nerve impulse. Synaptic transmission. Brainchemical composition, metabolism, metabolic adaptation, neurotransmitters and cAMP. Biochemical aspects of learning and memory. Enkephalins and endorphins.

Unit V Physiology of reproductive system

General anatomy of the male and female reproductive organs, steps of spermatogenesis, spermatozoan, transportation of sperm, female reproductive process – Maturation of ovum(Oogenesis) and fertilization process. Hormonal regulation of reproduction and pregnancy – Male and female sex hormones

***Employability**

REFERENCES:

1. Essentials of medical physiology – K.Sembulingam
2. Human physiology – C.C.Chatterjee.
3. Concise medical physiology – Chaudhuri
4. Human physiology(systemic and applied) - Subhash shalya
5. Text book of Medical physiology – Guyton
6. Text book of human physiology – Sharadha subramaniam

Course Code	Course Title	L	T	P	C
20120AEC44	Fundamentals of Computing	5	1	0	5

Aim:

To equip the students with Basic concepts of computing

Course Objective:

- Identify the main system elements of a computer system.
- Describe the main hardware components of a Personal Computer
- Describe the main software elements of a computer system
- Describe the Internet Concepts.

Course Outcomes:

- Be familiar with basic hardware and software types
- Be familiar basic understanding of the structure and operation of a computer
- Identify the components required to build different types of Multimedia tools
- Be familiar basic understanding of the Internet concepts

UNIT I

Introduction to Computer – Classification of Digital Computer system – Computer Architecture – Memory Units – Auxiliary Storage Devices – Input and Output devices.

UNIT II

Introduction to Computer Software - Operating System – Programming Languages – General Software features and trends.

UNIT III

Database System: Introduction – Data processing – Introduction to Data Base Management System - Data base design.

UNIT IV

Internet -Introduction - hardware and software requirement web browser-email concepts-chatting – Intranet – WWW concepts.

UNIT V

Multimedia tools – Virtual Reality – E-Commerce – Data warehousing – Data mining – Geographical Information System – Computer in Business, industry, home, education and training.

***Skill Development**

Text book:

1. Fundamentals of Information technology – Alexis leon, Mathews leon , BPB Publications,
2. The compact guide to micro-soft office professional Ron Mansfield, BPB publications

ENVIRONMENTAL STUDIES

(for under graduate students)

Course Code	Course Title	L	T	P	C
201ENSTU45	Environmental studies	2	0	0	2

Aim

- Creating awareness about the environmental problems among people. Imparting basic knowledge about the environment and its allied problems

Course Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- **Striving to attain harmony with Nature.**

Course Outcomes:

Students who graduate with a major in environmental science will be able to:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
4. Apply their ecological knowledge to illustrate and graph a problem and
5. describe the realities that managers face when dealing with complex issues; and
6. Understand how politics and management have ecological consequences.

1. Nature of Environmental Studies

Definition, scope and importance.

Multidisciplinary nature of environmental studies

Need for public awareness.

2. Natural Resources and Associated Problems.

- a) Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.
- b) Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
- d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.
- e) Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
- f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of an individuals in conservation of natural resources.

2. Ecosystems

Concept of an ecosystem.
Structure and function of an ecosystem.
Producers, consumers and decomposers.
Energy flow in the ecosystem.
Ecological succession.
Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystem:
a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.
Bio — geographical classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
India as a mega — diversity nation.
Western Ghat as a biodiversity region.
Hot — spot of biodiversity.
Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.
Endangered and endemic species of India.
Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

5. Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

6. Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides.
Urban problems related to energy Water conservation, rain water harvesting, watershed management
Resettlement and rehabilitation of people; its problems and concerns.
Environmental ethics: Issue and possible solutions.
Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
Wasteland reclamation.
Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.
Environmental Protection Act.
Air (Prevention and Control of Pollution) Act.
Water (Prevention and control of Pollution) Act.
Wildlife Protection Act.
Forest Conservation Act.
Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural / Industrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems — ponds, river, hill slopes, etc.

*Skill Development

References:

- 1) Agarwal, K.C., 2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)
- 3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- 4) Clank R.S., Marine Pollution, Clarendon Press Oxford (TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) De A.K., Environmental Chemistry, Wiley Western Ltd.
- 7) Down to Earth, Centre for Science and Environment, New Delhi. (R)
- 8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
- 10) Heywood, V.K. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, V.J. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
- 12) Mickinney, M.L. and School. R.M. 1996, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
- 13) Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).
- 14) Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574zp.
- 15) Rao M.N. and Dana, A.K. 1987, Waste Water Treatment, Wxford & IBH Publ. Co. Pvt. Ltd., 345p
- 16) Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut
- 17) Survey of the Environment, The Hindu (M)
- 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)
- 20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
- 21) Wagner K.D., 1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
- 22) Paryavaran shastra — Gholap T.N,
- 23) Paryavaran Sahastra — Gharapure
(M) Magazine
(R) Reference
(TB) Textbook

Course Code	Course Title	L	T	P	C
20115AEC46L	Biochemical Techniques Lab-II	0	0	3	2

Aim

The aim of the course is study about Hematology experiments and buffer preparation

Course Objective:

- Describe the process of buffer
- Discuss how the hemoglobin, hematocrit, erythrocyte to indices, and ESR are used to diagnose.
- Discuss how the clinical science of hematology

Course outcomes (CO's):

By the end of the course,

- students can be able to demonstrate the importance of the blood, buffer and their wide applications
- This skill based course will teach the students the various instrumentations that are used in the analytical laboratories.
- This course covers both fundamental and applications of the instruments that are routinely used for the characterization of biomolecules
- Perform skillful specimen collection, identification and processing
- Utilize communication skills necessary for working in the health care setting
- Exhibit professionalism, initiative, positive interpersonal skills, teamwork, respect and integrity.

EXPERIMENTS

1. Preparation of Buffer varying in their strength and pH value of Acetate, Phosphate, Bicarbonate and Citrate buffers.
2. Determination of pKa value of Amino acids
3. Hematology
 - ABO Blood grouping,
 - Haemoglobin estimation,

RBC Count WBC count

Blood smear preparation,

ESR,

PCV

*Employability/Entrepreneurship

REFERENCES:

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer
4. Introductory Practical Biochemistry – S.K.Sawhney, Randhir Singh.

Course Code	Course Title	L	T	P	C
20120AEC47L	WEB DESIGN LAB	0	0	3	2

Aim

The aim of this lab is to to develop an ability to design and implement static and dynamic website

Course Outcome

- Acquire knowledge about functionalities of World Wide Web and E-Mail.
- Apply a structured approach to identifying needs, interests, and functionality of a website.
- Write well-structured, easily maintained, standards-compliant, accessible HTML code.
- Write CSS code to present html pages in different ways.
- ExploreMarkup languages features and create interactive web pages using them.
- Design dynamic websites that meet specified needs and interests.
- Learn and design Client side validation using scripting languages.
- Acquire knowledge about Scripting libraries

Course objective

- This course is intended to teach the basics involved in publishing content on the World Wide Web.
- This includes the ‘language of the Web’ – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting.
- This will also expose students to the basic tools and applications used in Web publishing.

Experiments

1. Create a Web page for ABC INFOTECH LTD., with necessary images and marquee.
2. Create Web pages which displays the menu card of a hotel. The first page should contain the list of items available. After selection of one item, the corresponding details should be displayed on the next page.

3. Create a Web page which displays the balance sheets for the given list of companies (same as above problem).
4. Create a Web page for XYZ INFOTECH LTD., to display the company profile employee details balance sheet, receive resume, customer service using links.
5. Using frames create web pages for a travel agency
6. Create a Web page using forms for our college students admission process. (Use list box, push button, radio button, command button, rich text box, text box, etc where ever applicable)
7. Create a Web page which receives suggestions from customers for a software development & consultancy agency using necessary.

***Skill Development**

REFERENCE

1. Achyut Godbole, Atul Kahate "Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing", Third Edition, McGraw Hill Education.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
3. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torchbearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence, and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course, students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach to leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation

- Team work
- Negotiation
- Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?

- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

***Skill Development**

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- ☒ Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019- 02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- ☒ India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention

- ▣ Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - .
"A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6): 60.
- NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

Course Code	Course Title	L	T	P	C
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	2

Course Outcome:

- **Understand and practice quantitative aptitude**
- Understand and practice Logical reasoning
- Understand and practice verbal reasoning
- **Understand different placement practice techniques**

1. General Aptitude

- Introduction
- Introduction to Aptitude Tests
- Diagnostic Tests
- Introduction to Speed Maths
- Quantitative Ability – Number Theory
- Numbers
- Properties of Numbers
- Concept of Multiples and Factors
- LCM and HCF
- Factorial Concept
- Last Digit Concept
- Remainders Concept

Quantitative Ability - Arithmetic - 1

- Percentage
- Ratio and Proportion
- Simple Interest and Compound Interest
- Profit Loss
- Discount
- Mixture and Allegation
- Questions from Company Papers will be discussed

Quantitative Ability - Arithmetic - 2

- Speed Distance Time
- Time and Work
- Chain Rule
- Clocks and Calendars
- Averages
- Questions from Company Papers will be discussed

Quantitative Ability – Algebra

- Basic Terminologies in Algebra
- Equations

- Simple Equation
- Quadratic Equation
- Cubic Equation
- Functions
- Graphs
- Maxima and Minima
- Questions from Company Papers will be discussed

Quantitative Ability – Modern Maths

- Set Theory
- Fundamental way of Counting
- Permutations and Combinations
- Probability
- Questions from Company Papers will be discussed
- Data Analysis
- Data Sufficiency

Analytical and Logical Reasoning

- Mono variate conditions
- Multi variate conditions

Puzzles

- Coding
- Decoding
- Family tree
- Direction sense
- Alpha numeric
- Brain teasers
- Deductive Reasoning
- Visual Sequence
- Mathematical Reasoning

2. English Aptitude

Fill in the blanks

Comprehension

Odd man out

Phrases and Sentences

Sequencing

Basic Grammar

*Skill Development

SEMESTER V

Course Code	Course Title	L	T	P	C
20115AEC51	Enzymes	4	1	0	4

Aim

To learn the application of enzymes in health and diseases

Course objectives

- To understand the basic concepts of enzymes
- To study the kinetics of enzyme catalysed reactions
- To learn the mechanism of action of enzymes and enzyme inhibition concepts
- To understand various modes of enzyme regulation

Course outcomes (CO's)

- o Understand the basic concepts on enzymes
- o Relate the initial velocity and substrate concentration of enzymes and be able to understand the kinetics of inhibition reactions
- o Able to understand the regulation pattern of various enzymes
- o Relate the regulation pattern of enzymes for its application in health and diseases
- Understand the application of enzymes in Industrial and therapeutic.

Unit I

Enzymes – Definition, Nomenclature, Classification of enzymes based on IUB system, Properties, Enzymes Specificity, Specific activity, Coenzymes – Functions, (NAD,NADH,FAD,FMN,TPP,PLP) Units of enzyme activity, turn over number. Metallo enzymes and metal activated enzymes. Non-protein enzyme-ribozymes and abzymes.

Unit II

Mechanism of Enzyme action – Active site, Lock and key hypothesis, Koshland's model, Mechanism of enzyme catalysis – Acid base catalysis, covalent catalysis; enzyme regulation - Allosteric enzymes – properties - Feedback regulation;

Unit III

Enzyme Kinetics: Factors influencing enzyme activity. Derivation of Michaelis – Menton equation, Line weaver – Burk plot, activators,- enzyme inhibition (competitive, Non-Competitive and uncompetitive)- enzyme inhibitors.

Unit IV

Multienzyme complex – PDH, isoenzymes - lactate dehydrogenase - Immobilized enzymes – principles, methods and applications

Unit V

Applications of enzymes in industry and therapeutics - Clinical significance of serum enzymes - Enzyme electrodes, enzyme biosensors ,principles, types and their applications - Biochips.

***Employability/Entrepreneurship/Skill Development**

REFERENCES:

1. Enzymes – Dixon & Webb.
2. Understanding enzymes – T.Palmer, Prentice Hall.
3. Fundamentals of enzymes – Price.
4. Biochemistry – Stryer
5. Enzymes – P.Ashokan.
6. Enzyme Kinetics – Marangoni A.G.

Course Code	Course Title	L	T	P	C
20115AEC52	Bioenergetics and Metabolism	4	1	0	3

Aim

The aim of this course is to associate concepts in the areas of bioenergetics and metabolism.

Course objectives

- The focus is on the main metabolic pathways involved in carbohydrate, lipid, and protein metabolism, how these pathways are regulated and disrupted in disease and how energy is obtained to meet the cell's needs.
- To shed knowledge on generation and transformation of energy in metabolic pathways.
- To know the various metabolic pathways associated with carbohydrate, lipid, protein and nucleic acid metabolism, their regulation and associated disorders.
- To understand the inter relationship of carbohydrate, lipid, protein and nucleic acid metabolism and understand the importance of TCA cycle.
- To aware about the homeostatis of glucose of metabolites by intrinsic and extrinsic control mechanism.

Course outcomes (CO's)

- Gain knowledge on glucose anabolic and catabolic pathways that ultimately control the glucose homeostatis.
- Able to explain the role of lipids, their metabolism and their stringent control by hormones and other factors.
- Understand the anabolic and catabolic processes associated with amino acids and nucleic acids and their regulation.
- Able to understand the energy Biological oxidation

Unit I : Approaches to Biochemical Investigations

Whole Organism studies – perfusion of isolated organs – Tracer Techniques and mutant studies. Studies of elucidation of metabolic pathways.

Bioenergetics: Free energy concept, standard free energy – loss of thermodynamics - endergonic and exergonic reactions, high and low energy phosphates – energy Transfer in metabolism.

Unit II: Carbohydrate metabolism

Glycolysis – reactions – energetics – oxidation of pyruvate – TCA cycle – reactions – amphibolic role - energetics – glycogenesis – glycogenolysis - Gluconeogenesis – HMP shunt - metabolic significance. Glucuronic acid cycle.

Unit III: Lipid metabolism

Lipogenesis – Fatty Acid synthase complex – Oxidation of fatty acids – (α, β, ω) – Role of carnitine – metabolism of Triglycerides and Phospholipids – Ketogenesis – ketolysis – Synthesis and degradation of cholesterol – lipoprotein metabolism.

Unit IV:Protein, nucleic acid and porphyrin metabolims

Biological value of protein - Nitrogen balance – Deamination – Transamination – Decarboxylation – Urea cycle. Biosynthesis and degradation of purine and pyrimidine nucleotides – *Denovo* and salvage pathway . Biosynthesis and degradation porphyrin and Heme.

Unit V:Biological oxidation

Biological Oxidation- Enzyme and Coenzymes in Oxidation – reduction reactions – Electron Transport chain – Inhibitors – Oxidative phosphorylation – Chemiosmotic Theory – mechanism – structure of ATP synthase complex - Inhibitors, uncouplers, Ionophores – substrate level phosphorylation.

***Employability/Entrepreneurship/Skill Development**

REFERENCES:

1. Harper's Biochemistry -Murray, etal., McGraw Hill.
2. Principles of Biochemistry - Nelson Co.- Lehninger.
3. Biochemistry – Champe
4. Biochemistry – An introduction - Mckee.
5. Textbook of Medical Biochemistry – M.N.Chatterjee.

Course Code	Course Title	L	T	P	C
20115AEC53	Immunology	4	1	0	4

Aim

The aim of the course is deals with the study of an organism's immune system, in both health and disease.

Course Objectives:

- The students will be able to identify the cellular and molecular basis of immune responsiveness.
- The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.
- The students will be able to describe immunological response and how it is triggered and regulated.
- The students will be able to demonstrate a capacity for problem-solving about immune responsiveness.
- The students will be able to transfer knowledge of immunology into clinical decision-making through case studies presented in class.

Course Outcomes (CO's):

The students may understand the immune system, its components and various techniques used in bio manipulation.

- Describe surface membrane barriers and their protective functions.
- Explain the importance of phagocytosis and natural killer cells in innate body defense.
- Describe the roles of different types of T cells, B cells and APCs.
- Compare and contrast the origin, maturation process, and general function of B and T lymphocytes.

Unit I

The immune system-Components – Lymphoid Organs, Primary, Secondary, Tertiary – Lymphoid Tissues – Cells of the immune system. Immunity-Innate, Acquired – Active and Passive immunity – phagocytosis – Inflammation.

Unit II

Antigens-Antigenicity – Immunogenicity – Types of antigens – Haptens – specificity– Blood group antigens – Blood grouping and applications. Immunoglobulins. Structure – Functions – classes of immunoglobulins and functions. Complement system - Complement – classical and alternate pathway – Consequence of activation .

Unit III

Immune response- B and T cell development Cellular interactions – Antigen Presenting Cell(APC) –Major Histocompatibility complex (MHC) – cytokines – T Cell Receptor(TCR) – cluster of differentiation – Humoral Immunity (HI) and Cell Mediated Immunity (CMI) – Regulation of immune response – Primary and secondary immune response – Immuno tolerance.

Unit IV

Serological Techniques- Antigen – Antibody reactions -characteristics – Precipitation – types – immunodiffusion – Immuno-electrophoresis - Agglutination – Complement Fixation - opsonization – bacteriolysis - Immunofluorescence – RIA and ELISA . Production of antisera – Production of monoclonal and polyclonal antibodies – Hybridoma technology.

Unit V

Immunity to infection - Autoimmunity – causes – types – hypersensitivity – classification – mechanism – organ transplantation – graft rejection- tissue typing – immunosuppressive drugs.

***Employability/Entrepreneurship/Skill Development**

REFERENCES:

1. Kuby, Immunology - Richard .A. Goldshy, WM.Freeman & Co.
2. Roitts. Essential Immunology Roitt et al., Blackwell science
3. Immunology, Short Course - Eli Benjamin AV. et al.
4. Fundamentals of Immunology - Wier et al.
5. Fundamental Immunology - Coleman.
6. Immunology an introduction – Tizard

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
20115DSC54A	Pharmaceutical Biochemistry	4	1	0	3

Aim

The aim is to identify the needs and differences in drug use for various patient groups, and devise appropriate strategies from perspectives of dosage forms.

Course objectives The students should be able to:

- Explain the relationship among physicochemical and biological factors, dosage forms, routes of administration and therapeutic outcomes
- Illustrate the principles of pharmaceuticals and biopharmaceuticals in dosage form design and development
- Describe production procedures, quality control measurements and stability improvements for tablets and sterile products and different routes of drug administration in principles and applications

Course outcomes (CO's)

- Students be able to explain biopharmaceutical, physiological, biochemical and cell biology-related aspects on the transport and metabolism of drugs in the gastrointestinal tract and in the liver.
- Students be able to explain mechanisms behind the transport of drug and metabolism and how drugs can interact with other drugs and food and methods to study these - having developed its ability to plan, compile, analyse and report experiment that has importance for biopharmaceutical issues -
- Students be able to account for regulatory requirements within the biopharmaceutical area
- Students be able to describe the role of biopharmaceuticals in drug development within the pharmaceutical industry

Unit I

Pharmacodynamics and kinetics- Drug – Definition, Nomenclature, Classification. Routes of drug administration. Drug Absorption, Drug Distribution. Principles of Drug action, Mechanism of drug action – physical, chemical, enzymes, receptors. Combined effect of drugs. Dose – response relationship. Factors modifying drug action- novel methods of drug administration. Drug excretion – kinetics of elimination.

Unit II

Biotransformation – endogenous and exogenous substance – benzpyrene and phenacetin – bilirubin – corticosteroids - Phase I and Phase II reactions - Drug metabolizing enzymes. Cytochrome P450 monooxygenase and flavin monooxygenase – Physiological important of Xenobiotic metabolism.

Unit III

Chemotherapy – Antibacterial , Antifungal, Antiviral agents. Cholinergic and Anticholinergic drugs. Cardiac glycosides – digitalis – hypolipidemic drugs - statins – Plasma expanders.

Unit IV

Adverse Drug Effects – Side effects – secondary effect – Toxic effects – Poisoning – Intolerance – Idiosyncrasy – Drug allergy – Photosensitivity – Drug addiction – Drug abuse – Drug withdrawal reactions – Teratogenicity. Biochemical Mechanism of Drug resistance. Toxicity assessment- acute, subchronic, chronic exposure, determination of ED₅₀ and LD₅₀ values.

Unit V

Anaesthesia – Stages of Anaesthesia. Anaesthetic classification – Inhalational and Intravenous anaesthetics. Antiepileptic drugs – Phenobarbitone, Phenytoin. Antianxiety drugs. Benzodiazepines. beta-blockers. Antimaniac drugs – Lithium carbonate. Antiseptics and Disinfectants – phenol and related compounds, formaldehyde, ethanol.

***Employability**

REFERENCES:

1. Essentials of Medical Pharmacology – K.D.Tripathi.
2. Principles of Medicinal Chemistry – W.O.Foye.
3. Pharmacology and pharmacotherapeutics – R.S Satoskar et al.,
4. Textbook of pharmaceutical chemistry – Jayashree ghosh
5. Biochemistry an introduction – Mckee

Course Code	Course Title	L	T	P	C
20115DSC54B	Basic Biotechnology	4	1	0	3

AIM:

The aim of the paper to study about basic biotechnology about animal and plant tissue culture, genetic and transformation techniques in animals, plants and its applications in various fields.

Course Objectives:

- It gives introduction to the various transformation techniques employed in animal, plant systems.
- It also describes the application of genetically modified animals, plants in the various fields of science.
- The techniques of animal cell, plant tissue culture and its industrial and medical applications are described.

Course Outcome:

- To understand principles of animal culture, media preparation.
- To explain basic principles of cloning.
- To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
- To describe commercial production of fuels, microbial enzymes.
- To explain the microbial degradation of pesticides, Bioremediation& Biofertilizers

Unit I: Fermentation Biotechnology –Biotechnology – scope and importance, Basic principles of microbial growth, Bioreactor- batch and continuous bioreactor, fermentation culture medium, downstream processing. Fermentation production of penicillin and vitamin B12.

Unit II: Food and Industrial Biotechnology – Fermentation production of yoghurt and cheese.Production of single cell protein; spirulina: cultivation and uses. Biofertilizers – blue green algae: cultivation and uses. Production of amylase and protease.

Unit III: Molecular Biotechnology - Basic principles of cloning, Introduction of foreign DNA in to host by particle bombardment gun, electroporation and microinjection. Basic Polymerase Chain Reaction (PCR), applications, Micro arrays, the human genome project.

Unit IV: Animal and Plant Biotechnology – Elementary details of Animal cell and tissue culture, medium, transfection, targeted gene transfer, transgenic

animals. Plant cell and tissue culture, medium, totipotent, pluripotent cells, protoplast culture, artificial seeds, and transgenic plants.

Unit V: Environmental Biotechnology – Biological fuel generation- ethanol and methane from biomass. Sewage treatment. Bioremediation: oil spill cleanup, bioleaching, IPR, Biosafety and hazards of environmental engineering.

*Employability

REFERENCE BOOKS:

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA- B.R. Glick & J.J. Pasterak, ASM Press, Washington, D.C., 2010
2. Gene cloning and DNA analysis: an introduction / T.A. Brown.—6th ed. Brown, T.A. (Terence A.) Wiley-Blackwell. 2010.
3. Elements of Biotechnology- P.K.Gupta, Rastogi Publications, 2nd edition 3rd reprint, 2015-2016.
4. A text book of Biotechnology- R.C.Dubey, S.Chand Publications, 2014
5. Industrial Microbiology- A.H.Patel, Macmillan, India Ltd, 2012 6. Animal Cell Culture and Technology, Michael Butler Garland Science/BIOS Scientific Publishers, Second Edition, London and New York. 2004.

Course Code	Course Title	L	T	P	C
20115AEC55L	Food and Enzyme Analysis Lab	0	0	3	2

Aim

Analyze the optimum pH, substrate concentration for the maximum enzyme activity and food analysis

Course Objectives

- To estimate the mineral content in food
- To know the sources of enzymes and study the extraction and partial purification of enzyme acid phosphatase
- To standardize the optimum pH, optimum substrate concentration required for the maximum activity of acid phosphatase
- To analyse the inhibition pattern by various competitive inhibitors for the enzyme acid phosphatase purified from germinated mung bean
- To assay the activity of Lactate dehydrogenase and glucose – 6 – phosphate dehydrogenase enzymes

Course outcome (CO's)

- To illustrate various aspects of food engineering.
- To know the sources of enzymes and study the extraction and partial purification of enzyme.
- To standardize the optimum pH, optimum substrate concentration required for the maximum activity of enzyme.
- The students will be expertise in estimation of minerals in food.
- To understand the optimum activity of enzyme.

EXPERIMENTS:

1. Moisture Content of Food Materials.
2. Ash Content of Food Materials.
3. Determination of calcium in food.
4. Estimation of Fat Content in Food Materials.
5. Estimation of Nitrogen in Food
6. Estimation of Iron in Food
7. Estimation of Phosphorus in Food
8. Estimation of Vitamin C in Food by Dye method
9. Determination of Alkaline Phosphatase Activity.
 - a. Effect of PH

- b. Effect of Temperature.
 - c. Specific Activity
 - d. K_m (Saturation Method).
10. Determination of Salivary Amylase Activity.
- a. Effect of PH
 - b. Effect of Temperature.
 - c. Specific Activity
 - d. K_m (Saturation Method).

*Employability/Entrepreneurship/Skill Development

REFERENCES:

1. Manuals in Biochemistry – Dr.J.Jayaraman.
2. Practical Biochemistry – Plummer.
3. Manuals in Biochemistry – Dr.S.Ramakrishnan.

Course Code	Course Title	L	T	P	C
20115AEC56L	Immunology Lab	0	0	3	2

Aim:

The study of the immunological techniques

Course Objective:

Upon successful completion students will –

- To promote critical thinking among students;
- to provide students with a foundation in immunological processes;
- to provide students with knowledge on how the immune system works building on their previous knowledge from biochemistry, genetics, cell biology and microbiology;

Course Outcome

- This course has been designed to provide hands-on experience on the tools and techniques used in immunology.
- The experiments have been designed in such a way that the student will have the opportunity to isolate a specific protein from a natural source, purify it and determine its activity
- Besides, students will get an opportunity to learn diffusion and electrophoresis.
- Basic understanding of Immunotechnology
- Study the principle and applications of various immuno techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay

EXPERIMENTS

1. Double Immunodiffusion
2. Single Radial Immuno diffusion
3. Rocket Immunoelectrophoresis
4. Direct ELISA
5. Haemeagglutination tests for indentification of human blood groups
6. Detection by viral fever by slide agglutination tests.
7. Dialysis.

***Employability/Entrepreneurship/Skill Development**

REFERENCES:

1. Manuals in Biochemistry – Dr.J.Jayaraman.
2. Practical Biochemistry – Plummer.
3. Manuals in Biochemistry – Dr.S.Ramakrishnan.
4. Klemir and others: Practical Biological Chemistry.
5. Practical Biochemistry – Koch and Hank Dunn and Drell
6. Practical Biochemistry - Sawhney(2000)
7. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London,1988).

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Aim:

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare a good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills

Resume Skills: Preparation and Presentation

- Introduction of resume and its importance
- Difference between a CV, Resume and Bio data
- Essential components of a good resume

Resume skills : common errors

- Common errors people generally make in preparing their resume
- Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

Interview Skills: Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview

- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

Interview Skills: Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

Interview Skills : Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

***Skill Development**

SEMESTER VI

Course Code	Course Title	L	T	P	C
20115AEC61	Clinical Biochemistry	4	1	0	4

Aim

The Aim of the course to study about Clinical Chemistry and use of laboratory investigations in connection with diseases of the major organs and the systems

Course Objectives

The general **objectives** of the **course** are:

- Familiarize students with the specific characteristics of a laboratory of **clinical biochemistry**.
- Understanding the pathophysiology and molecular basis of the most prevalent diseases.
- Know the analytical methods commonly used in the **clinical** laboratory.

Course Outcomes

At the end of the course,

- the student will be able to describe the diagnostic laboratory, according to the main stages pre-analytical, analytical and post-analytical
- describe the diagnostic significance of the main laboratory investigations know the problems related to the preparation of the patient, the collection and knowledge of the samples .
- Describe the various disorders
- Understand and explain the acid-base and water-electrolyte balance in the body.
- Understand the difference between plasma, serum, normal and abnormal constituents in various body fluids. Blood clotting mechanism and anticoagulants.
- Explain the nature and function of various enzymes, normal levels and elevated levels in various diseases.
- Comprehend that blood is a universal fluid for carrying different minerals, nutrients, proteins etc to and from various tissues.
- Learn that many diseases result from imbalance in certain enzymes and helps in diagnosis of liver, cardiac, gastrointestinal, kidney diseases.

Unit 1

Gastric function tests- hyper, hypo and achlorhydria. Liver function tests. Jaundice hemolytic, hepatic and obstructive jaundice. Renal function tests. Biochemical findings in nephritis and nephrotic syndrome. Normal and abnormal constituents of urine.

Unit 2

Disorders of carbohydrate metabolism: Sugar level in normal blood maintenance of blood sugar concentration- endocrine influence on carbohydrate metabolism, hypoglycemia, hyperglycemia, glycosuria, renal threshold value, diabetes mellitus classification, complications; Glucose tolerance test (GTT), diabetic coma, diabetic ketoacidosis, glycogen storage diseases, fructosuria, galactosemia and hypoglycemic agents.

Unit 3

Disorders of lipid metabolism. Plasma lipoproteins- lipoproteinemias, lipid metabolism in liver and adipose tissue. Fatty liver. Hypo and hypercholesterolemia. Atherosclerosis.

Unit 4

Disorders of amino acid metabolism. Plasma proteins in health and disease. Disorders of purine, pyrimidine and porphyrin metabolism. Hyperuricemia and gout. Lesch- Nyhan syndrome. Orotic aciduria, porphyrias.

Unit 5

Disorders of endocrine system. Disorders of thyroid, pituitary, adrenal medulla, and sex hormones. Disturbances in blood clotting mechanisms- hemophilia and anemia. Complications of Acquired immune deficiency syndrome (AIDS)

***Employability/Entrepreneurship/Skill Development**

REFERENCES

1. Applied Biochemistry of clinical disorders – Allan G. Gornall.
2. A clinical companion to Biochemical Studies – Victor Schwarz.
3. Biochemistry for Medical Students – Ambika Shanmugam.
4. Practical Clinical Biochemistry – Harold Varley.
5. Clinical Biochemistry in diagnosis and treatment. Mayne ELBS.

Course Code	Course Title	L	T	P	C
20115SEC62	Molecular Biology	4	1	0	5

Aim

The aim of the paper to study about Molecular biology.

Course objectives

The course aims to provide students with a basic understanding of

- Organization of DNA in a genome and the mechanism behind replication, transcription and translation.
- Regulation of gene expression in prokaryotes and Eukaryotes.

Course outcomes (CO's)

At the end of the course, student will be able to

- Discuss the most significant discoveries and theories through the historical progress of biological scientific discoveries, and their impacts on the development of molecular biology.
- Compare the structure of eukaryotic cells with the structure of simpler prokaryotic cells and with the structure of viruses
- To understand molecular concept of DNA, RNA.
- They will be familiarized with mechanism of action and resistance to antibiotics at molecular level
- They will be able to describe the mechanisms of protein transport to various sub cellular sites and process of protein degradation
- Students will be able to describe how gene expression is regulated at the transcriptional and post-transcriptional level.
- They will be able to read and understand scientific articles related to subject and gain a critical understanding of their contents.
- They will be able to give a spoken and written presentation of scientific topics and research results.

Unit I

DNA – Types, Properties, Structure and Functions. DNA as genetic material – Griffith experiment. Watson and Crick Model of DNA. RNA-, Types, Properties, Structure and Functions.

Unit II

DNA Replication – conservative, Semiconservative, Dispersive mode of Replication. Enzymes involved in replication. ϕ X 174 Replication. Eukaryotic genome organization.

Unit III

RNA synthesis – RNA processing. Genetic code – Wobble hypothesis – Protein synthesis. Post translational modification. Inhibitors of transcription and Translation.

Unit IV

Operon concept – Lac Operon, Trp Operon, DNA methylation. DNA repair,
Mutation - types – Recombination – Transposition – transposable elements..

Unit V

Cancer – characteristics, Oncogenesis mechanism, proto oncogenes, Antioncogenes – tumor suppressor gene, anti cancer agents,. Recombinant DNA Technology – Cloning vehicles – plasmids – phages – cosmids – yeast – transgenic plants and transgenic animals - Applications of genetic engineering.

***Employability/Entrepreneurship/Skill Development**

REFERENCES:

1. Molecular Biology – Friefelder.
2. Molecular Cell Biology - Lodish
3. Molecular Biology of the Cell – Bruce Albert.
4. Molecular Biology of the Gene – Watson.
5. Genomes – T.A. Brown.
6. Advanced Molecular Biology – R.M.Twymann.

Course code	Course Title	L	T	P	C
20115DSC63A	Biochemistry of Plants and Microbes	4	1	0	3

Aim

- Build up the knowledge of the students in medicinal plant phytochemical screening.

Course objectives

- Open up the students to detailed plant physiological studies to pave way for plant tissue culture techniques.
- Students will have knowledge on some of the general methods used in the study of microorganisms and to recognize and compare structure and function of microbes and factors affecting microbial growth.

Course outcomes (CO's)

- The students are able to perform plant phytochemical pigments to study about water microbiology.
- Prepare stained smears, culture micro-organisms, perform tests to identify bacteria and fungi, and to study food microbiology

Unit I

Photosynthesis: Photosynthetic pigments and photosynthetic apparatus. Light Reaction, Hill Reaction. Emerson effect. Dark Reaction – CO₂ fixation in C₃, C₄, CAM Plants. Factors affecting photosynthesis and photorespiration. Plant growth regulators – growth hormones - growth inhibitors.

Unit II

Nitrogen Fixation – Symbiotic & Non Symbiotic enzymes - Nitrogenase, Nitrate assimilation, nitrate and nitrite reductase. Mineral Nutrients.

Unit III

Bacteria: Morphology – Ultra structure. Bacterial growth curve. Factors affecting growth. Blue Green Algae – Morphology – Algae – Biological Importance. Fungi Classification, Cultivation and morphology of yeast and moulds. Life cycle of Yeast.

Unit IV

Food Microbiology : Food spoilage, Food Preservation. Fermented foods, Infected food and human illness – botulism, clostridium welchi poisoning, staphylococcus poisoning. Salmonella infection.

Unit V

Water Microbiology: Purification of drinking water. Test for purity of Water, water borne diseases. Air borne Diseases. Antimicrobial agents. Viruses: Structure and replication of Viruses infecting bacteria, plants and animals.

*Employability/Entrepreneurship/Skill Development

References:

1. Plant Physiology – Devlin
2. Plant Physiology _ Hess
3. Microbiology _ Pelzar
4. Microbiology – Torotora
5. General Microbiology – Stanier.

Course Code	Course Title	L	T	P	C
20115DSC63B	Hospital Management	4	1	0	3

Aim:

The aim of this course is to enable the participants to understand the principles and practice of management and its application in hospitals.

Course Objectives:

This course aims to make understand the principles and practice of management. At the end of the course the students would be able to accept professional management practice in healthcare.

Course Outcomes:

- Understand the theories of management.
- Understand the management process and integrated approach in management.
- Manage service organizations by accepting the inbuilt challenges.
- Manage hospitals by understanding the complexity, levels and role of hospital administrator.
- Understand the current issues that have an implication in administration practice hospital administration

Unit I: Introduction to Hospital management: Eligibility and personal skills required for Hospital management. Job opportunities in Hospital management. Important hospital management Institutes in India and around the World.

Unit II: Hospital management system: Benefits and Modules of Hospital management systems. Interfacing of analyzer. Pathology lab management. Radiology, Blood Bank, Pharmacology, management softwares.

Unit III: Health Care Services: Health and Hospitals Services, Classification and Characteristics of Service Organizations, , Healthcare Revolution, Dimensions of Health, Indicators of Health- Composition of Health Sector, Types of Care, Pyramidal Structure of Health Services, Hospitals, Types of Hospitals and Role of Hospital in Healthcare.

Unit IV: Health care Facilities: Functioning of modern hospitals & changing need of patients Hospitality in Hospital Care, Invasive and non-invasive diagnostic facilities in modern hospital Care offered in Specialty and Super specialty Hospitals.

Unit V: Health and Management: Current Issues in Healthcare Accreditation-Tele medicine-Health Tourism-Health Insurance and Managed Care-Disaster Management-Hospital Wastes Management.

*Employability/Entrepreneurship/Skill Development

REFERENCE BOOKS:

1. Grant's Method of Anatomy: A Clinical Problem-solving Approach (BI Waverly Pvt. Ltd., New Delhi) John V. Basmajian and Charles E. Slonecker, ISBN 81- 7431-033-9, 1989.
2. Anatomy and Physiology for Nurses by, Watson, Roger, ISBN 9780702043581, 2013.
3. Textbook of Preventive and Social Medicine (M/S Banarsidas Bhanot Elaine La Monica, J.E. Park and K. Park, Management in Health Care (Macmillan Press Ltd, London) 2011.
4. Principles of Hospital Administration and Planning (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi), B.M. Sakharkar, 2009.
5. Hospital Administration (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi), C.M. Francis and et al., 2004. 6. Management Process in Health Care (Voluntary Health Association of India, S. Srinivasan (ed.), New Delhi), 1992.

Course Code	Course Title	L	T	P	C
20115AEC64L	Hematology and Clinical Biochemistry Lab	0	0	3	2

AIM:

The aim of the paper to study about hematological and clinical biochemical experiments

COURSE OUTCOME

- Explain the origin of blood cells and articulate the process of erythropoiesis and leukopoiesis as it relates to health and disease.
- Discuss the coagulation process and its role in maintaining hemostasis.
- Demonstrate current hematological procedures used to diagnose, monitor and evaluate disorders.
- Demonstrate the basic principles of hematology and clinical biochemistry instrumentation
- Describe and Identify inborn defects in metabolism and correlate them with deficiency of key metabolic markers in the clinical laboratory, their common methods of analysis, and their clinical significance.
- Relate laboratory results to clinical diagnosis and relationship to heart, liver, kidney and pancreas function.

COURSE OBJECTIVE

- Familiarize students with the specific characteristics of a laboratory of clinical biochemistry.
- Understanding the serological diseases.
- Know the analytical methods commonly used in the clinical laboratory.
- Know how can contribute the clinical laboratory to assess the health status of individuals.

EXPERIMENTS

Hematology Experiment:

1. To determine total platelet count
2. To perform PT
3. To perform APTT
4. To perform thrombin time
5. Determination of haemoglobin by various methods.
6. Determination of Total RBC count.

Clinical Biochemistry experiment:

1. Estimation of Glucose by Ortho Toluidine Method
2. Estimation of Cholesterol by Zak's Method

3. Estimation of Protein by Biuret Method
4. Estimation of Iron by Dipyriddy Method
5. Estimation of Urea by DAM Method
6. Estimation of Uric Acid by Caraway Method
7. Estimation of Calcium by Clark and Collip Method
8. Estimation of Bilirubin by Malloy and Evelyn Method

*Employability/Entrepreneurship/Skill Development

REFERENCES:

1. Practical Clinical Biochemistry – Harold Varley.
2. Textbook of Clinical Chemistry – Tietz.
3. Manuals in Biochemistry – Dr. J. Jayaraman.
4. Manuals in Biochemistry – Dr. S. Ramakrishnan.
5. Practical Biochemistry – Plummer.

Course Code	Course Title	L	T	P	C
20115SEC65L	Molecular biology Lab	0	0	3	2

Aim

The aim of the paper to study about molecular experiments

Course Objective: The student

- Can use a broad range of basic and advanced methods in molecular biology
- Can examine, assess, interpret and communicate data acquired from laboratory experiments
- Molecular Biology gives in-depth knowledge of biological and/or medicinal processes through the investigation of the underlying molecular mechanisms.

Course Outcome

- Exhibit a knowledge base in genetics, cell and molecular biology.
- Demonstrate the knowledge of common and advanced laboratory practices in cell and molecular biology.
- It can explain the principles of separation of DNA.
- To know the general safety routines for laboratory work in molecular biology.

EXPERIMENTS:

1. Estimation of DNA by Diphenylamine method
2. Estimation of RNA by Orcinol method
3. Isolation of DNA from bacterial, plant and animal cells
4. Separation of DNA by Agarose gelelectrophoresis
5. Isolation of Plasmid DNA from E.coli
6. Estimation of DNA and purity determination by UV absorption method.

*Employability/Entrepreneurship/Skill Development

REFERENCES:

- Practical Clinical Biochemistry – Harold Varley.
- Gel Electrophoresis of Nucleic acids, A Practical Approach (1990) by D Rickwood and BD Hames. Oxford Univ. Press. Refer the books already mentioned for other Molecular Biology course.
- Manuals in Biochemistry – Dr.J.Jayaraman.
- Analytical biochemistry and separation techniques lab manual iii edition P.Palanivelu
- Practical Biochemistry – Plummer.

Course Code	Course Title	L	T	P	C
201ENOE C	Open Elective - Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements, Ethics of Journalism, Press

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters, Qualities, types

UNIT- IV

The Editor and the Sub Editor-qualities, types, editorial department,

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials, articles, middle, features, column

*** Skill Development**

References:-

- Journalism -Susan
- Professional Journalism - John Hogenberg
- News Writing and Reporting - M.James Neal (Surjeet Publication)
- Professional Journalism -M.V Komath
- The Journalist's Handbook -M.V Komath
- Mass Communication & Journalism - D.S Mehta

Course code	Course Title	L	T	P	C
201MAOEC	Open Elective Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Course Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Course Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, "Operations Research"

* Skill Development

Course Code	Course Title	L	T	P	C
191PHOEC	Open Elective- Instrumentation	4	0	0	2

Aim:

- Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Course Objectives:

- The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.
- A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data. Understand that there are finite limits to our ability to make good measurements, and why.

Course Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.
- Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges : AC bridges – Maxwell, Owen, Schering and De Sauty’s bridges – Wien bridges.

UNIT – II: Electronic Instruments – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: Electronic Instruments – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Books for Reference:

A Course In Electrical And Electronic Measurements and Instrumentation – A.K.

Sawhmey – Dhanpat Rai and Sons – 1990.

Electronic Measurements And Instrumentation – Oliver Cage – McGraw Hill –1975.

* Skill Development

Course Code	Course Title	L	T	P	C
201CHOEC	Open Elective-Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Course Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislative aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Course Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

* Skill Development

Course Code	Course Title	L	T	P	C
191CSOEC	Open Elective- E-Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

*** Skill Development**

Course Code	Course Title	L	T	P	C
201CAOEC	Open Elective -Web Technology	4	0	0	2

Aim:

- To equip the students with basic programming skill in Web Designing

Course Objective:

- To understand and practice mark up languages
- To learn Style Sheet and Frames

Course Outcomes:

Explore markup languages features and create interactive web pages using them

Learn and design Client side validation using scripting languages

UNIT I

Introduction to the Internet – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms.

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

Reference Book

Principles of web design – Joel Sklar – Vikas publishing house 2001.

*** Skill Development**

Course Code	Course Title	L	T	P	C
201CMOEC	Open Elective-Banking service	4	0	0	2

Aim:

- To provide the bank is financial institution which is involved in borrowing and lending money.

Course Objective:

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

Course Outcome:

- To help to gather knowledge on banking and financial system in India
- To provide knowledge about commercial banks and its products
- To create awareness about modern banking services like e-banking-banking and internet banking,
- ATM System
- To introduce recent trends in banking system
- To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits-Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking-Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features- Registration-Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM- Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

References Books

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh, Justin paul .

*** Skill Development**

Course Code	Course Title	L	T	P	C
201ACLSCET	Community Engagement	-	-	-	1

Aim:

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

Course Outcomes:

After completing this course, students will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and the bonds of mutuality with the local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of India lies in villages” (Gandhi), rural infrastructure.

UNIT II-Understanding rural economy & livelihood

Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati Raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan,

Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India,

Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

* Skill Development



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SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY CURRICULUM

20 REGULATION



PRIST
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NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF BIOCHEMISTRY
M. Sc., Curriculum-Regulation 2020

PROGRAMME OUTCOME(POs)

PG biochemistry graduate will be able to achieve

- ❑ **PO 1. Critical Thinking and Effective Communication:** The teaching is intended to kindle the critical thinking of the student to address problems (Problem based learning) and equip them to list out their understanding (Activity based learning). The syllabus also includes journal paper presentation and analysis on specific topics of all subjects which will be evaluated by faculty handling the subject.
- ❑ **PO 2. Future Career:** To prepare students for future careers in the various fields of biochemistry such as academic and research institution.
- ❑ **PO 3. Societal Contribution and Social Interaction:** The Biochemistry Programme will benefit the society on the whole by adding to the highly skilled scientific workforce, particularly for the biomedical research sectors, in the academic, industry as well as for research laboratories across the country and the globe. Inside the classrooms group discussion is encouraged on topics during the last five minutes of class to improve the understanding and to share the knowledge and view point. Outside the classroom, various outreach programme are conducted on various health initiatives.
- ❑ **PO 4. Identification and Differential Diagnosis:** To acquire biochemist position in leading hospitals and scientist position in industries.
- ❑ **PO 5. Ethics:** Students learn about the significance of having right moral features to develop good interpersonal skills.

PROGRAMME SPECIFIC OUTCOME (PSOs)

- o To prepare students for future careers in various fields of biochemistry by enhancing analytical and critical-thinking skills in which a core understanding of the chemistry of biological processes is important for the understanding of human health and disease.

- o To equip highly skilled scientific workforce, particularly for the biomedical research sectors, in the academic, industry as well as for research laboratories across the country and the globe.
- o The skills acquired in the programme will help the students in acquiring scientific, academic and industrial positions such as Analyst, Research Scientist at Pharma (R&D) Industries, Academician, Project Associates (JRF, SRF), Doctoral Research positions abroad at India and abroad. Clinical biochemist at renowned hospitals, medical coding, Scientific writers.

PROGRAMME EDUCATIONAL OBJECTIVE (PEOs)

- ☐ **PEO 1.** The course aims to impart advanced and in depth understanding on all the human physiological and pathological state. To understand the molecular process and their perturbation during disease.
- ☐ **PEO 2.** The programme covers various aspects of Biomolecule estimation and regulation to ascertain health and disease state. metabolic pathways alterations along with their regulation at the replication, transcriptional, translational, and post-translational levels including by studying DNA, RNA and protein molecules, immunology, endocrinology, advancements in rDNA technologies to circumvent genetic disorders.
- ☐ **PEO 3.** Further to enrich research understanding various genomic, proteomic and bioinformatics tools are added. Animal cell culture, IPR, Biostatistics, research methodology, clinical research and Plant tissue culture are offered as elective papers to get specialized in a specific area. The final semester is devoted exclusively to enrich the students to address specific research objective.
- ☐ **PEO 4.:** Understand the role of citizen to maintain sustainable environment and encourage Eco-friendly initiatives.
- ☐ **PEO 5.:** Acquire the ability to engage in independent and life-long learning in the broadest context of health and disease.

M.Sc., BIOCHEMISTRY(C₁)

- C1- Biomolecules
- C2- Biochemical and Instrumental analysis
- C3- Enzymology
- C4- Biochemical Techniques Lab - I
- C5- Research Led Seminar
- C6- Cellular Biochemistry
- C7- Metabolism and Regulation
- C8- Neuro Biochemistry

- C9- Enzymology Lab- II
- C10- Research Methodology
- C11- Participation in Bounded Research
- C12- Molecular Biology
- C13- Clinical Biochemistry
- C14- Clinical Biochemistry Lab
- C15- Design/Socio technical research
- C16- Molecular Basis of diseases
- C17- Environmental Biochemistry
- C18- Molecular and Environmental biochemistry lab
- C19- Discipline Specific elective I –IV
- C20- Project Work

M. Sc., Curriculum Mapping

Programme Educational Objectives vs Programme Outcome

POs	1	2	3	4	5
PEO I	*		*		
PEO II	*		*	*	*
PEO III	*	*	*	*	*
PEO IV		*		*	
PEO V	*		*		*

M. Sc., Curriculum Mapping

Programme Outcome vs Course Outcome

Programme Outcome- PO	PO1	PO2	PO3	PO 4	PO5
Course Outcome-CO					
CO1	*	*	*	*	*

CO2	*	*		*	*
CO3	*	*	*	*	*
CO4	*	*	*		
CO5	*	*	*	*	*
CO6	*	*	*	*	*
CO7				*	*
CO8	*	*	*	*	*
CO9				*	*
CO10	*	*	*	*	*
CO11			*	*	*
CO12	*	*	*	*	*
CO13	*	*	*	*	*
CO14				*	*
CO15	*	*	*	*	*
CO16				*	*
CO17	*	*	*	*	*
CO18		*	*	*	*
CO19	*	*	*	*	*
CO20	*	*	*		



SCHOOL OF ARTS AND SCIENCE

**M. Sc
BIOCHEMISTRY -SYLLABUS – REGULATION 2020
COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
SEMESTER I					
20215SEC11	Biomolecules	6	1	0	5
20215SEC12	Biochemical and Instrumental analysis	6	1	0	5
20215SEC13	Enzymology	6	1	0	4
20215SEC14L	Biochemical Techniques Lab - I	0	0	4	2
20215DSC15_	Discipline specific elective	5	0	0	4
20215RLC16	Research Led Seminar	-	-	-	1
Total		23	3	4	21
SEMESTER II					
20215SEC21	Cellular Biochemistry	5	1	0	5
20215SEC22	Metabolism and Regulation	5	1	0	5
20215SEC23	Neuro Biochemistry	5	0	0	4
20215SEC24L	Enzymology Lab- II	0	0	4	2
20215DSC25_	Discipline Specific Elective -II	5	0	0	4
20215RMC26	Research Methodology	3	0	0	2
20215BRC27	Participation in Bounded Research	-	-	-	2
Total		23	2	4	24
SEMESTER III					
20215SEC31	Molecular Biology	6	1	0	6
20215SEC32	Clinical Biochemistry	6	1	0	6
20215SEC33L	Clinical Biochemistry Lab	0	0	5	3
20215DSC34_	Discipline Specific Elective -III	5	0	0	4
202_OEC	Open Elective	4	0	0	3
20215SRC35	Design/Socio technical research	-	-	-	2
Total		21	2	5	24
SEMESTER IV					
20215SEC41	Molecular Basis of diseases	6	1	0	6
20215SEC42	Environmental Biochemistry	6	1	0	6
20215SEC43L	Molecular and Environmental biochemistry lab	0	0	5	3
20215DSC44_	Discipline Specific elective –IV	5	0	0	4
20215PRW45	Project Work	-	-	-	6

20215PEE	Programme Exit Examination	-	-	-	2
	Total	17	2	5	27
	Total Credits for the Programme				96

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a) 20215DSC15A – Biostatistics b) 20215DSC15B – Immunology
	Discipline specific Elective Courses-II
II	a) 2015DSC25A- Endocrinology b) 20215 DSC25B- Clinical nutrition and dietetics c) 20215 DSC25C – Bioinformatics
	Discipline specific Elective Courses-III
III	a) 20215DSC34A- Genetics and Genetic Engineering b) 20215DSC34B- Pharmaceutical Biotechnology
VI	a) 20215DSC44A – Medical Biotechnology b) 20215DSC44B – Applied Microbial Biochemistry

Open Electives

Semester	Open Elective Courses
III	202ENOEC - Writing for the media 202MAOEC - Applicable Mathematics Techniques 202PHOEC - Bio-Medical Instrumentation 202CHOEC - Green Chemistry 202CSOEC - M-Marketing 202CMOEC - Financial Services

Credit Distribution:

Sem	SEC	DSC	OEC	RSB Courses	Others	Total
I	16	4	-	1	-	21
II	16	4	-	4	-	24
III	15	4	3	2	-	24
IV	15	4	-	6	2	27
Total	62	16	3	13	2	96

*Employability

*Employability/Entrepreneurship/Skill development

*Employability/Skill development

Course Code	Course Title	L	T	P	C
20215SEC11	Biomolecules	6	1	0	5

Aim

To know the structure and role of water in biological system

Course objectives

- To understand the structure and organization of carbohydrates, lipids, proteins and nucleic acids
- To realize the interactions nucleic acid with proteins

Course Outcomes

CO1- Recognize water as a universal solvent and elixir of life by knowing its importance

CO2- Identify the properties and classification of carbohydrates

CO3 -Recall the role of various lipids in biomembrane including signal transduction

CO4 -Categories the amino acids and know their properties

CO5 -Differentiate the structure, properties and functions of DNA and RNA

CO6 -List the functions and deficiency disease of fat and water soluble vitamin

Unit I: Carbohydrates:

Occurrence, classification, characteristics, structure and functions of monosaccharides, disaccharides, trisaccharides and polysaccharides; Structure and conformation of sugars; Stereoisomerism and optical isomerism; Selected chemical reactions of the functional groups; Sugar derivatives; Mucopolysaccharides; Glycosaminoglycans; Proteoglycans; Glycoproteins.

Unit II: Lipids:

Classification and types of lipids; Structure, nomenclature and properties of fatty acids; Glycosides; Soaps; Micelles; Structure, classification, properties and functions of phospholipids and sphingolipids; Glycolipids; Composition and biological role of lipoproteins; Structure and functions of steroids and prostaglandins; Eicosanoids; ω 3 and ω 6 fatty acids.

Unit III: Amino acids, nucleotides and water:

Structure, nomenclature, classification, acid-base behavior and chemical reactions of amino acids; Stereoisomerism and optical properties of amino acids; Modified amino acids; Nucleotides; Water and its physicochemical properties, Ionization of water, pH scale, Henderson-Hasselbalch equation.

Unit IV: Hormones/Signaling:

Molecules General characteristics of hormones and other signaling molecules; Classification, functions, mechanism of action and abnormalities of the hormones of

thyroid, pancreas, hypothalamus, pituitary and gonads; Hormone replacement therapy; Plant hormones with specific reference to Auxins; Pheromones: types and functions.

UNIT V: Terpens:

Terpens - classification - isoprene rule - isolation - structural formula of Geranion , nerol , menthoil and terpenol. Alkaloids - general methods of isolation - structural formula of cocaine, papin, nicotine-applications. Vitamin- classification - occurrence- biological importance of fat soluble and water soluble vitamins. Minerals - macro and micro nutrients -examples.

REFERENCES:

1. Fundamentals of Biochemistry-Voet and voet.
2. Haper's Biochemistry ,26 th ed., McGraw Hill.
3. Organic chemistry of natural products -O.P Agarwal
4. Biochemistry -A.C.Deb.
5. Medical Biochemistry-Baynes.
6. Proteins-T.E Creighton.
7. Principles of Biochemistry-Lehinger,Neison and Cox.

***Employability**

Course Code	Course Title	L	T	P	C
20215SEC12	Biochemical and Instrumental Analysis	6	1	0	5

Aim

The aim of this paper to study about Biochemical analysis, xenobiotics and biotic (macromolecules, proteins, DNA, large molecule drugs, metabolites) in biological system.

Course objectives

- The primary objectives of this course are to develop the skills to understand the theory and practice of bio analytical techniques.
- To provide scientific understanding of analytical techniques and detail interpretation of results

Course outcomes (CO's)

CO 1 This skill based course will teach the students the various instrumentations that are used in the analytical laboratories.

CO2 Understanding the principles of Electrophoresis, Spectrophotometry and ELISA and their applications in biological investigations/experiments

CO3 This course covers both fundamental and applications of the instruments that are routinely used for the characterization of biomolecules

CO 4 Develop competence in handling various chromatographic techniques and apply them in isolating and characterizing different biological molecules.

CO 5 Purify proteins by affinity chromatography

CO 6 Understanding the principles of Electrophoresis, Spectrophotometry and ELISA and their applications in biological investigations/experiments

CO 8 To acquire the good laboratory practices

UNIT - I

Electrochemical techniques - General principles and electrochemical reactions, pH measurements, Standard hydrogen electrode, oxygen electrode, metallic indicator and membrane indicator electrodes, Biosensors and biochips – Principles, methods and applications. Radioisotopes - Law of radioactivity and decay processors, Detection methods - Scintillation counter and autoradiography; Applications of radioisotopes in biology.

UNIT - II

Chromatography - Principles, materials, packing, instruments, optimization of column performance and application of Affinity chromatography, Immunoaffinity chromatography, size-exclusion chromatography, Ion-exchange chromatography, RPHPLC, HPLC, GLC, GSC, Super critical fluid chromatography and chromatofocussing. Centrifugation - Typing of

centrifuges; Principles and application of differential, density gradient and analytical ultracentrifuges.

UNIT - III

Electrophoresis – Principles- theories – Factors affecting electrophoretic mobility; Agar gel electrophoresis, PAGE, SDS-PAGE, Capillary electrophoresis, Isoelectric focussing electrophoresis and Pulse Field gel electrophoresis.

UNIT – IV

Spectroscopy – Principles, Instrumentation, application and limitations of UV-Visible spectrometry, Fluorescence spectrometry, Raman Spectroscopy, IR Spectroscopy, AAS, ORD, CD, ESI – and MALADI- Mass Spectrometry, Basic concepts and applications of ESR, NMR, X-Ray crystallography and laser techniques.

UNIT – V

PCR – general principles; Types of PCR – Single sided PCR, Reverse PCR, RT-PCR and RACE-PCR; Applications of PCR in general and clinical diagnosis; ELISA – DAS-ELISA, DAC-ELISA and PAC-ELISA; Use of molecular probes in analyzing RFLP, DNA finger printing and DNA foot printing; Hybridization techniques; Chromosomes walking, Blotting techniques – Southern, Northern and Western blotting.

REFERENCES:

1. Instrumental analysis – Chatwall & Anand.
2. Practical Biochemistry – David T.Plummer.
3. Principles of Instrumental analysis – B.K.Sharma.
4. Practical Biochemistry – Wilson & Walker.
5. Biophysical Chemistry – Upadhayay & Upadhayay
6. Instrumental analysis – Skoog.

***Employability/Entrepreneurship/Skill development**

Course Code	Course Title	L	T	P	C
20215SEC13	Enzymology	6	1	0	4

Aim

The course aims to provide an advanced understanding of the core principles and topics of enzymes.

Course Objective

- To understand the structure of enzymes and their classifications.
- To analyze the active site of enzymes by various experimental approaches.
- To learn the importance of enzyme immobilization and its wide applications in medicine and industries.
- To study various fermentor designs and culture systems.
- To understand the application of fermentation process in industry.
- To learn the fermented products preparation, downstream processing and its industrial applications

Course Outcomes

- CO1 Upon successful completion of this course, the student will learn, the major classes of enzyme and their functions in the cell.
- CO2 The course also provides information pertaining to role of co-enzyme cofactor in enzyme catalyzed reaction, properties of enzymes and regulation of biochemical pathways.
- CO3 To acquire fundamental knowledge on enzymes and their importance in biological reactions.
- CO4 Exposure to the concept of activation energy and its importance in biological reactions.
- CO5 Understanding the role of enzymes in clinical diagnosis and industries.
- CO6 Exposure to the nature of non-protein enzymes such as ribozymes.
- CO7 Differentiate between equilibrium and steady state kinetics and analyzed simple kinetic data and estimate important parameter (K_m , V_{max} , K_{cat} etc)

UNIT-I

Enzymes- Introduction to enzymes, purification, localization, extraction of enzymes, properties, Nomenclature and IUB classification of enzymes, specificity of enzymes, units of enzyme activity, assay of enzymes-principle, turn over number-Coenzymes- Active site - investigation of active site structure, formation of ES complex.

UNIT-II

Enzyme inhibition and kinetics- Michaelis- Menton plot, linear transformation, Lineweaver- Burk plot, Eadie - Hofstee plot equations, Factors affecting enzyme action. Irreversible and reversible competitive, non competitive, uncompetitive inhibition. Pre steady state kinetics, Kinetics of Allosteric enzymes, sequential bisubstrate mechanism. Ping-Pong reactions, End product inhibition and substrate inhibition- K_{cat}

UNIT-III

Enzyme regulation,;General mechanism of enzyme regulation,allosteri regulation, feed back inhibition and feed forward stimulation, Enzyme repression, induction and degradation, control of enzymic activity by products and substrates.

UNIT-IV

Mechanism of enzyme catalysis- Acid base catalysis, covalent catalysis,Mechanism of action of lysozyme, carboxy peptidase-A, chymotrypsin, DNA polymerase, RNAase and serine proteases. Isoenzyme forms and multi functional enzymes- FAS system, PDH. Metal dependent and metalloenzymes.

UNIT-V

Enzyme technology- immobilization of enzymes- methods- properties and applications- abzymes- ribozymes- artificial enzymes- DNA enzymes- enzyme engineering - Enzymes in Pharmaceuatical industry, Leather industry, detergent industry and Food industry- Research, theraoeutic and clinical diagnosis.

REFERENCES:

1. Principles of Biochemistry - Zubay.
2. The nature of Enzymology - Foster.
3. Basic concepts of enzymes - Trevor Paimer.
4. Biochemistry-Lehninger.
5. Enzyme Kinetics-Marangani A.G.
6. Industrial enzymes and their applications-Uhlig H . John Wiley.

***Employability/Entrepreneurship**

Course Code	Course Title	L	T	P	C
20215SEC14L	Biochemical Techniques Lab - I	0	0	4	2

Aim

The aim of the paper to study about quantitative measurement Biochemical compounds.

Course objectives

- To teach students on various techniques used for the assessment of various diseases and research studies.
- To teach the good laboratory practice required to execute the learned techniques.

Course outcomes (CO's)

- CO1 By the end of the course, students can be able to demonstrate the importance of the protein chemistry and their wide applications.
- CO2 This skill based course will teach the students the various instrumentations that are used in the analytical laboratories.
- CO3 This course covers both fundamental and applications of the instruments that are routinely used for the characterization of biomolecules
- CO4 Perform skillful specimen collection, identification and processing
- CO5 Utilize communication skills necessary for working in the health care setting
- CO6 Exhibit professionalism, initiative, positive interpersonal skills, teamwork, respect and integrity.

EXPERIMENTS:

1. Estimation of proteins, DNA, RNA and Carbohydrates by Colorimetric methods.
2. Determination of Concentration and extinction co-efficient of proteins spectrophotometer.
3. Analyzing the Quality of Oils – acid number, Saponification number and Iodine number.
4. Estimation of ascorbic acid and calcium from natural sources.
5. Estimation of Sodium, Potassium and Phosphorous in body fluids by flame photometry.
6. Separation of amino acid and lipids by Thin layer chromatography.
7. SDS- PAGE of proteins.
8. Separation of proteins by Size –exclusion chromatography.

REFERENCE:

1. Instrumental analysis – chatwall & Anand.
2. Practical Biochemistry - David T.plummer.
3. Principles of instrumental analysis - B.K. Sharma.
4. Practical Biochemistry – Wilson and Walker.
5. Biophysical Chemistry - Upadhyay and padhyay
6. Instrumental analysis – Skoog.

***Employability/Entrepreneurship/Skill development**

Course Code	Course Title	L	T	P	C
20215DSC15A	Biostatistics	5	0	0	4

Aim

The aim is Students able to characterize data and understand different sampling methods.

Course Objective

Mathematical and statistics form an integral part of any discipline of science.

Course Outcomes

CO1 To use basic analytical techniques to generate results

CO2 interpret results of commonly used statistical analyses in written summaries

CO3 demonstrate statistical reasoning skills correctly and contextually

CO4 They play an important role in interpretation of result of experiments and research work.

This course will provide information how to utilize various tools of biostatistics in interpretation of biological data.

CO5 The students will understand the principles of collection of data in biological experiments, proper statistical analysis of the data and its presentation.

CO6 Knowing statistical methods will help students in improving their analytical and interpretation skill.

UNIT – I

Research – definition, importance and types – Literature survey – journals – types, abstracting and indexing journals – Internet and its applications-e Mail – Web browsing – selection of topics – research schedule – sample collection – techniques – data collection – interpretation of data - art of scientific writing – presenting a scientific seminar.

UNIT – II

Probability:- Definition – Addition theorem – Multiplication Theorem (Statement only) – Conditional Probability – Independent events – Simple Problems.

UNIT – III

Measure of Averages – Mean, Median and mode, Use of these measures in biological studies, Measures of Dispersion for biological characters – Quartile Deviation, Mean Deviation and Standard deviation and coefficient of variation, Measures of skewness and Kurtosis, Correlation and Regression – Rank Correlation – Regression equations, Simple problems based on biochemical data.

UNIT – IV

Basic concepts of sampling – Simple random sample, stratified sample and systematic sampling, Sample statistics, Sampling distribution and standard error, Tests of significance based large samples, Test for mean, difference of mean, proportions and equality of proportion.

UNIT – V

Small sample tests – Student ‘t’ test for mean, difference of two means, test for correlation and regression coefficients, Chi-square test for goodness of an independence of attributes, F test for equality of variances.

REFERENCES:

1. Sundar Rao, Jesudian Richard – An Introduction to Bio-Statistics.
2. Alwi E.Lewis, Bio-Statistics, East West Press.
3. S.C.Gupta – Fundamental of Statistics, Sultan Chand.
4. Research methodology – Methods and techniques – C.R.Kothari.
5. Research methodology and statistical techniques – Santhosh Gupta.

***Employability**

Course Code	Course Title	L	T	P	C
20215DSC15B	Immunology	5	0	0	4

Aim:

To learn the immune system and reaction

Objectives:

- To expose the students with the immune system of human body

Outcomes:

- CO1 The students may understand the immune system, its components and various techniques used in bio manipulation.
- CO2 The course will provide technical knowledge as to how different diseases are caused and various responses mediated by living cells to combat pathogen attack.
- CO3 Compare and contrast the origin, maturation process, and general function of B and T lymphocytes.
- CO4 At The course will provide sound knowledge of how immune system deals with various pathogens, different processes and cell types involved in prevention of disease.
- CO5 To understand the principles of tolerance, autoimmunity and the role of immunity in protection against pathogens.
- CO6 Along with this the students will become aware about concept, synthesis and action mechanism of vaccines.

UNIT-I

Infection

Types – Factors influencing infection – endotoxins and exotoxins – pathogenicity and virulence – sources of infection agents – carriers – portals of entry. **Immunity:** Innate – Acquired – Active and Passive Immunity – phagocytosis – Inflammation. **Immune system:** Components – Lymphoid organs, Primary, Secondary, Tertiary – Lymphoid Tissues – Cells of the immune system.

UNIT-II

Antigens: Antigenicity – Immunogenicity – Types of antigens – Haptens – specificity – Blood group antigens – Blood grouping. **Immunoglobulins:** Isolation – structure and function – Antibodies – classes of immunoglobulins – Biosynthesis and antibody diversity. **Complement:** Complement – chemical and alternate pathway – Consequence of activation – Anaphylotoxins.

UNIT-III

Immune response: B and T cell development Cellular interaction – APC – MHC – cytokines – TCR – cluster of differentiation – HI and CMI – Regulation of immune response – Primary and secondary immune response – Immune tolerance - Immune suppression.

UNIT-IV

Immunological Techniques: Antigen – Antibody reaction – Precipitation – Agglutination – CTI – Torsion neutralization – Immunodiffusion – Immunofluorescence – Immune adherence

– Immuno-electrophoresis – EIA – ELISA – RIA – Immunochemistry – Hybridoma Technology – Merits and Demerits – Production of Vaccines and their uses. Production of antisera – Fractionation of leucocytes – Identification of lymphocytes and their subsets – Experimental animal models – Inbred strains – SCID Mice, Nude mice – mice cell culture system.

UNIT-V

Immunodeficiency disorders – Cancer and AIDS – Immunity to bacteria and viruses – Auto immunity – Hypersensitivity – classification. Organ Transplantation – Graft rejection – mechanism – Tissue typing – immunosuppressing drugs – Immunotherapy.

REFERENCE:

1. Immunology – Richard A. Goldsby and Kuby.
2. Essential Immunology – Roitt et al.
3. Immunobiology – Janeway. C: Paul Travers.
4. Immunology, Short Course – Eli Benjamin AV. et al.
5. Fundamentals of Immunology Springer Verlag – Wier et al.
6. A Handbook of Practical Immunology – G.P. Talwar.
7. Fundamental Immunology – Coleman.
8. Textbook of microbiology – Anantha marayanan & panikar.

***Employability**

Course Code	Course Title	L	T	P	C
20215SEC21	Cellular Biochemistry	5	1	0	5

Aim

To understand the molecular machinery of living cells.

Course objectives

- To enable the students to understanding the molecules within cells and interactions between cells that allows construction of multi cellular organisms.
- To understand the membrane transport mechanisms.

Course outcomes (CO's)

- CO1 Describe the general principles of gene organization and expression in both prokaryotic and eukaryotic organisms.
- CO2 Describe the structure and function of biological membranes including the roles of gradients in energy transduction.
- CO3 Explain the basic pathways and mechanisms in biological energy transduction from oxidation of metabolites to synthesis of ATP.
- CO4 Explain various levels of gene regulation and protein function including signal transduction and cell cycle control.
- CO5 To become aware with the variations in the levels of triglycerides and lipoproteins and their relationship with various diseases.
- CO6 Relate properties of cancerous cells to mutational changes in gene function.

UNIT I

Cell & cell cycle: Cell structures- plant and animal cell structures, Types of tissues- Epithelium – Organization and its types. Bones, Cartilage structure. Extra cellular matrix- ECM components, Collagen, Elastin, Fibrillin, Fibronectin, Laminin, Proteoglycans.

UNIT II

Biomembrane- Membrane assembly- Unit membrane concept, physical, Physiological functions and properties. Different forms of plasma membrane- gap junction, tight junction, Plasmadesmata, desmosomes- Active, passive transport system- Endocytosis, Exocytosis.

UNIT III

Cell division- mitosis-meiosis- significance. Cell cycle-phases and regulation- check points in cell cycle- programmed cell death-Apoptosis- Necrosis-Autolysis.

UNIT IV

Signal Transduction-types of signaling-receptors- signaling pathways-second messengers- cyclic nucleotides- lipids- calcium ions- cross talk signaling pathways.

UNIT V

Cancer biology-morphology and characteristics of cancer cells- Benign and malignant tumors- tumor markers- agents causing cancer- mechanism of carcinogenesis- Oncogenes and proto oncogenes- tumors suppressor genes- p53-Telomerase-anti cancer agents

***Employability/Entrepreneurship**

REFERENCES

1. Cell and molecular biology-De. Robertis
2. Cell biology-CB Powar
3. The cell- Cooper
4. Molecular cell biology-Lodish et. al.,

Course Code	Course Title	L	T	P	C
20215SEC22	Metabolism and Regulation	5	1	0	5

Aim

The course aims to provide an advanced understanding of the metabolism and its regulation.

Course objectives

- To know the various metabolic pathways associated with carbohydrate, lipid, protein and nucleic acid metabolism, their regulation and associated disorders.
- To understand the inter relationship of carbohydrate, lipid, protein and nucleic acid metabolism and understand the importance of TCA cycle.
- To aware about the homeostatis of glucose of metabolites by intrinsic and extrinsic control mechanism.

Course outcomes (CO's)

- CO1 Gain knowledge on glucose anabolic and catabolic pathways that ultimately control the glucose homeostatis.
- CO2 Describe surface membrane barriers and their protective functions.
- CO3 Able to explain the role of lipids, their metabolism and their stringent control by hormones and other factors.
- CO4 To acquire knowledge related to the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance.
- CO5 Understanding the importance of high energy compounds, electron transport chain, synthesis of ATP under aerobic and anaerobic conditions.
- CO6 Understand the anabolic and catabolic processes associated with amino acids and nucleic acids and their regulation.
- CO7 Able to understand the energy homeostatis during starvation and energy excess.

UNIT -I

BIOENERGETICS

Thermodynamics-Free energy-energy Transfer-energy Compounds -ATP-Enzymes involved in redox reactions. Electron transport chain -Inhibitors- Oxidative Phosphorylation -Chemiosmotic Theory-Inhibitors -uncouplers-Ionophores-Regulation-substrate level Phosphorylation. Electron transport system -Mitochondrial and Microsomal system -Shuttle Mechanism -Malate and glycerol phosphate shuttle.

UNIT -II

CARBOHYDRATE METABOLISM

Glycogen metabolism -Glycogen storage diseases -Regulation -Glycolysis -control -Oxidative decarboxylation -PDH complex -energetics -TCA cycle -regulation -energetics.

Gluconeogenesis -Glucogenic substates -Cori cycle and Glucose alanine cycle-regulation - HMP shunt and metabolic significance-Glucuronic acid cycle-Blood glucose homeostasis.

UNIT-III

LIPID METABOLISM

Adipose Tissue-Lipogenesis -FA Synthase complex -Regulation -Oxidation of fatty acids -alpha,beta,omega-carnitine shuttle-Metabolism of Triglycerides-Phospholipids and glycolipids-Regulation. Ketogenesis-Ketolysis-Metabolism of cholestrol-Bile acids - lipoprotein meatabolism.

UNIT-IV

NITROGEN METABOLISM

Nitrogen balance -Oxidative and Non Oxidative demination -Transamination - Transdeamination -decarboxylation -Biogenic amines -Ureogenesis and regulation. Essential and non essential amino acids - Ketogenic and ghlycogenic amino acids - Anabolism and catabolism of individual amino acids - disorders of amino acid metabolism. Biosynthesis of purine and pyrimidines -*Denovo* and salvage pathway - Catabolism of purines and pyrimidines - disorders of nucleic acid metabolism.

UNIT-V

METABOLIC INTEGRATION AND REGULATION

Role of hormones -Insulin - Role of organs - Liver, Brain, Kidney, Muscle and Adipose tissue - Metabolic interrelationship in well-fed state, fasting state, Obesity, starvation, Diabetes Mellitus, Exercise, injury, stress and pregnancy and lactation.

REFERENCE:

1. Harper's Biochemistry. Murrat etal,Mcgraw Hill.
2. Principles of Biochemistry - Nelson Cox,Lehninger,McMillen Worth.
3. Biochemistry - Stryer - Freeman.
4. Biochemistry - Zubay.
5. Biochemistry - Champe - Lippincott.
6. Biochemistry with Clinical Correlations - Delvin.
7. Biochemistry - Mathews,Vanholde and Ahern.
8. Biochemistry - An Introduction - Mackee.
9. Textbook of Medical Biochemistry M.N.Chatterjee.

***Employability/Entrepreneurship**

Course Code	Course Title	L	T	P	C
20215SEC23	Neuro Biochemistry	5	0	0	4

Aim:

The course aims to provide students with a basic understanding of: the principles and major mechanisms of metabolic control and of molecular signalling by hormones; the control of cell proliferation

Course Objective:

By the end of the course, students should be able to:

- demonstrate knowledge and understanding of the molecular machinery of living cells;
- demonstrate knowledge and understanding of the principles that govern the structures of macromolecules and their participation in molecular recognition;
- use basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments.

Course outcomes:

- CO1 To understand various neurological system
- CO2 Recognize the need for, and engage in life-long learning in neurological system
- CO3 To understand various Exocytosis of neurotransmitter
- CO4 To able to understand DNA microarrays, Methodology, types and applications
- CO5 To acquire knowledge related to LEARNING AND MEMORY
- CO6 Gain knowledge of contemporary issues
- CO7 to understand biochemistry of vision and muscle contraction

UNIT I : NERVOUS SYSTEM

Structure and function of the brain. Central Nervous System, Peripheral and Autonomic Nervous system. Cells of Nervous System – Neurons, Astrocytes, Glial cells, Oligodendrocytes and Schwann cells. Chemical composition of brain – utilization and uptake of glucose and amino acids, Blood – Brain barrier.

UNIT II: NEUROTRANSMISSION

Membrane potentials, Resting potential – Depolarization, repolarization and hyperpolarization, Action potential. Mechanism of axonal neurotransmission. Membrane channels – Types of channels, ion gated, voltage gated, chemically gated, mechanically gated and responsive to intracellular messengers. DISEASES OF NERVOUS SYSTEM Molecular basis of Parkinson's disease, Alzheimer's disease, Schizophrenia, Myasthenia gravis and Multiple sclerosis.

UNIT III: NEUROTRANSMITTERS

Synthesis, storage, release, uptake, degradation and action of neurotransmitters. Acetyl choline, GABA, Serotonin, Dopamine, Glutamate, Aspartate, Nitrous oxide, etc. Neuropeptides. Synaptic transmission – Cholinergic receptors – Nicotinic and Muscarinic

receptors, Agonists and Antagonists – their mode of action and effects. Adrenergic receptors, serpentine receptors and intracellular signaling. Fast and slow receptors. Exocytosis of neurotransmitter – Role of synapsins, synaptogamins, SNAP, SNARE and other proteins in docking, exocytosis and recycling of vesicles.

UNIT IV : LEARNING AND MEMORY

Mechanism of short term memory and Long Term Potentiation. NMDA and AMPA glutamate receptors. Retrograde messengers in synaptic transmission. Role of CAM kinase II, Calcium, protein kinases, cAMP, NO, Calpain and other proteins in memory and learning process. Synaptic plasticity INTERACTION OF DRUGS WITH CNS Mechanism of action of anesthetics, analgesics, hallucinogens, depressants, stimulants and toxins on the nervous system. Addiction and drugs of abuse.

UNIT V: BIOCHEMISTRY OF VISION AND MUSCLE CONTRACTION:

Rod and cone cells, visual cycle, mechanism and regulation of vision, color vision. Thick and thin filaments, interaction of actin and myosin muscle contraction, role of calcium and regulation of muscle contraction. Smooth muscle contraction and its regulation

***Employability/Entrepreneurship**

REFERENCE

1. Neurochemistry by Ferdinand Hucho, VCH Publication, 1986
2. Molecular cell Biology, by Lodish, Baltimore, et al W.H. Freeman & Co. !996
3. Basic Neurochemistry by M. P. Spiegel

Course Code	Course Title	L	T	P	C
20215SEC24L	Enzymology Lab- II	0	0	4	2

Aim:

To list the factors that can affect the rate of a chemical reaction and enzyme activity

Course Objectives:

- To obtain a general knowledge about how enzymes work.
- To determine the optimum pH, temperature and concentration of an enzyme for a certain reaction.
- To demonstrate skill and knowledge in the use of the spectrophotometer.
- To learn methods and calculations for diluting material in the lab

Course Outcomes:

- CO1 Students will gain an enhanced overall understanding of enzymology, enzyme assays, and in particular the influence of various physicochemical characteristics upon enzyme activity.
- CO2 Acquiring training to estimate activity of enzymes.
- CO3 To determine pH optimum, K_m and V_{max} of enzymes and to analyse enzyme kinetics
- CO4 To determine optimum temperature for the activity of an enzyme.
- CO5 Students will gain direct laboratory experience in spectrophotometry.
- CO6 Students will gain an understanding of buffers and their importance in the context of pH control.
- CO7 Students will gain an appreciation of working as part of an integrated research team.

EXPERIMENTS:

1. Determination of enzyme activity and specific activity of Salivary amylase, Lipase, Catalase, Lactate dehydrogenase and Glucose -6-phosphate dehydrogenase.
2. The progress curve of acid phosphate and amylase – catalyzed reactions.
3. Effect of PH and Temperature on enzyme activity of urease and alkaline phosphatase.
4. Determination of activation energy and K_m value of any two enzymes.
5. Effect of activation and inhibitors on activity of any one enzyme.
6. Estimation of free energy of any two enzymes.

REFERENCES:

1. Manuals in Biochemistry – Dr.J.Jayaraman.
2. Practical Biochemistry – Plummer.
3. Manuals in Biochemistry – Dr.S.Ramakrishnan.

***Employability/Entrepreneurship/Skill development**

Course Code	Course Title	L	T	P	C
20215DSC25A	Endocrinology	5	0	0	4

Aim:

To have a basic understanding of the endocrine system

Course Objective:

The specific objectives of the program are to train the fellows to:

- History and physical examination with emphasis on examination of the thyroid, breasts, penis, testes and female reproductive organs.
- Selection and interpretation of endocrine biochemical tests.

Course Outcomes:

- CO1 Apply the knowledge from this course while working in medical laboratory to diagnose different hormone disorders
- CO2 Explain recent laboratory methods in diagnosis hormone disorders
- CO3 Knowledge and Understanding the synthesis of different endocrine gland hormones
- CO4 Ability to analyze and solve problems related to hormone tests
- CO5 To know the pathophysiology significance of the system with special reference to humans
- CO6-Understand the synthesis of various hormones by respective gland

UNIT: I

Hormones in general - definition – types of secretions – nature – classification synthesis and their role – Feed back control with specific examples Hormones action Proteins and Steroids – Cell Signaling in hormone action.

UNIT: II

Hypothalamo hypophysial axis - Hormones of hypothalamus and their role Structure of pituitary - Secretions - Physiology role -Pathophysiology Current status of pituitary as a master gland.

UNIT: III

Thyroid - Parathyroid - structure - hormones – synthesis – storage – releases- carrier proteins (eg. TBA and TBG) – Physiology role – Pathophysiology

UNIT: IV

Adrenal and Gonadal Hormones – Steroid biosynthesis – maintenance of cyclicity. Physiological role – Pathophysiology – Steroids in metabolism

UNIT: V

Gastro intestinal hormones – pancreas as an endocrine organ – secretions- functions – physiological role and pathophysiology other endocrine organs in vertebrate Insect and crustacean hormones – their role in growth and metamorphosis.

*Employability/Entrepreneurship

REFERENCE:

1. Text Book of endocrinology – Williams
2. Physiological review of Biochemistry – Harper and others
3. Endocrinology – Turner
4. Invertebrate reproduction – K K Nayar

Course Code	Course Title	L	T	P	C
20215DSC25B	Clinical nutrition and dietetics	5	0	0	4

Aim

- Are qualified to translate the science of nutrition in health and disease into practical information about food.

Course Objective

- Work to promote good health by teaching the public and other health professionals about diet and nutrition.
- Act as advisors to the Trust on the nutritional standards and specifications for the patient food service to ensure that the needs of all patients can be met.

Course Outcomes

- CO1 To learn glycemic index, balanced diet, micronutrient deficiencies and the remedies, nutraceuticals and their importance, junk foods and their hazards
- CO2 Understanding merits and demerits of vegetarian and non-vegetarian foods
- CO3 To understand the need for specialized food for people with special needs - diabetes, pregnancy, inherited genetic disorders
- CO4 To know the use of alternate crops – cereals and pulses and their importance
- CO5 Patients receive medical or surgical help with their conditions, but some have conditions that can also benefit from special diets. Eating more of certain foods, and/or avoiding certain things can help to control a patient's symptoms.
- CO6 In some cases, by carefully monitoring what a sick patient eats and drinks, the dietitian can reduce the chance that patient will have problems in the long-term, and can establish and/or help maintain the patient's quality of life

UNIT I

Definition of nutrition, over nutrition and undernutrition and malnutrition. signs of good and poor nutrition – relation of good nutrition to health. Nutritional deficiency disease – anaemia, protein. Calorie malnutrition, vitamin-A deficiency. Aetiology, symptoms, prevention and treatment. Role of dietary fibre in health and disease.

UNIT II

Energy- definition of calorie and joule. Energy value of foods – bomb calorimeter. Direct and indirect calorimeter. Basal metabolism, definition, methods of determining basal metabolism rate (BMR) ,factors influencing BMR – calculation of total energy requirement. Factors affecting total energy requirement, food sources.

UNIT III

Purpose and principles of therapeutic diets, hospital diets- etiology and dietary modifications. (a) Obesity, aetiology treatment. (b) Underweight – definition, aetiology, treatment. (c) Diet in febrile conditions- typhoid, tuberculosis. (d) Diabetes mellitus - definition, predisposing factors, factors that maintain blood glucose level, symptoms, diagnosis, biochemical changes in the metabolism of carbohydrates, fats, protein, food exchange list and treatment.

UNIT IV

(a) Diet in disease of gastrointestinal tract, peptic ulcer and duodenal ulcer, acute and chronic diarrhea, constipation. (b) Diet in disease liver-cirrhosis and hepatitis (c) Diet in disease of cardiovascular system- atherosclerosis and hypertension. (d) Diet in disease of kidney and urinary tract- acute and chronic nephritis and nephrotic syndrome.

UNIT V

(a) Assessing the food nutritional problems in the community methods available for the assessment of the nutritional status of an individual and the community. Assessment methods- nutritional anthropometry- biochemical tests-diet surveys. (b) Measures to overcome malnutrition. Role of nutrition education and nutrition intervention programmes. Role of ICMR, ICAR, CFTRI, ICDS,- nutritious noon meal programme, contribution of international organizations- WHO, UNICEF, FAO.

*Employability/Entrepreneurship

REFERENCES:

1. Antra, F.P. Clinical nutrition and dietetics, Oxford university press, Newyork(1998).
2. Krause. M,V and Nahan, L.K.Foods nutrition and diets(1998)H.B.saunders co..(1984).
3. Robinson,C.H.and Lawler,M.R. Normal and therapeutic nutrition Mac Millan pub.co.INC New York,17th Edition(1988)
4. Gopalan,C.Balasubrsmanian, S.C. and Ramasastrri,B.V.the nutritive value of Indian foods,KMR,Newdelhi(1989).
5. Davidson, S.Passmore,R.Brock,J.F and Truswell.A.S. Human nutrition and dietetics (1984) the English language book society.
6. Swaminathan. M.Essential of nutrition vol. I and II the ganesh and co., Madras(1974).
7. Gopalan, C and ramasastrri ,B.V. and Balasubramanian. S.C. (1989) Nutritive value of Indian foods ,NIN, Hydrabad.
8. Gopalan,C and Vijay araghavan,K.Nutriotion atlas of India ICMR. Newdelhi(1971).
9. Gopalan, C. Balasubramanian, S.C. and Visveswara rao, Diet atlas of India , ICMR, Newdelhi(1971).
10. Srilakshmi B. Msc, Mphil.(2004) dietetics,New age international publishers Newdlhi
11. Gopalan, C & Ramasastrri B.V. (1998)-the nutritive value of Indian foods. ICMR,Newdelhi

12. Dr.Swaminathan M. Hand book of food and nutrition the Bangalore printing and publishing company Ltd. Bangalore
13. Guthrie H.A Introductory nutrition, times Mirror,Mosby College Publication,1989, Whitney E.N. Hamilton M.N & Rofles S.R. Understnsding nitrition 5th edition, West pub.co. New York 1990
14. Anderson L. Nutrition in health and disease 17th edition JB Lippincott co.Philadelphia, 1982.

Course Code	Course Title	L	T	P	C
20215DSC25C	Bioinformatics	5	0	0	4

Aim:

The aims of bioinformatics are threefold. First, at its simplest bioinformatics organizes data in a way that allows researchers to access existing information and to submit new entries as they are produced, eg the Protein Data Bank for 3D macromolecular structures.

Course objectives: To make the students

- To make students understand the essential features of the interdisciplinary field of science for better understanding the biological data.
- To create students opportunity to interact with algorithms, tools and data in current scenario.
- To make the students look at a biological problem from a computational point of view.
- To find out the methods for analyzing the expression, structure and function of proteins, and understanding the relationships between species.

Course outcomes (CO's):

- CO1 The student will choose biological data, submission and retrieval from databases.
- CO2 The students will be able to experiment pair wise and multiple sequence alignment and will analyze the secondary and tertiary structures of protein sequences.
- CO3 The students will acquire training in different areas of bioinformatics related to various biological databases such as protein databases, nucleic acid databases, metabolic pathway databases, etc.
- CO4 To understand the Role of computers in Biology
- CO5 To know the Software in Bioinformatics - C, C++, bioperl, Biopython and oracle
- CO6 The student will understand the data structure (databases) used in bioinformatics and interpret the information (especially: find genes; determine their functions), understand and be aware of current research and problems relating to this area.

UNIT-I

Bioinformatics - Definition, the history and scope of Bioinformatics; Bioinformatics as a tool; Role of computers in Biology; The CPU and operating systems - computer networks - the internet, modem, the world wide web, search engines; FTP,HTML, URL and IP address; Virtual Library; search the biochemical information on SWISS - PROT, NCBI and MEDLINE.

UNIT-II

Software in Bioinformatics - C, C++, bioperl, Biopython and oracle. The Bioinformatics workstation, Unix system - Files, directories, Functions and application of Unix system.

UNIT-III

Data base - Types, data base management systems and data base security; biological data bases - sequence data bases for proteins and nucleic acids; searching sequence data bases; structural data base - PDB; Motif data bases; Genome data bases; Miscellaneous data bases, Data submission and data retrieval with Enterz.

UNIT-IV

Definition and concepts on homology, analogy, orthology and paralogy; sequence similarity searches - FASTA, BLAST, DBGET, SRS, Enterz. Theory and data bases of pair wise and multiple sequence alignments; BLOSUM matrices; phylogenetics - phylogenetic trees; sequence annotation, Markov models for data base similarity searches.

UNIT-V

Protein secondary structure predictions - Chow - Fasman, JPRED, AGADIR; Quandex; protein tertiary structure prediction - comparative modelling, fold Recognition and Ab initio prediction; Visualization of protein structures - RASMOL; Drug discovery - combinational chemistry and docking;

DNA microarrays - Methodology, types and applications - Goals of human genome project- structural and functional genome - Agroinformatics - Medical informatics - Metabolomics - E-cell.

REFERENCE:

1. Bioinformatics – David N.Mount
2. Bioinformatics computer skills – Cynthia Gibes and Peter Jamback
3. Recent advances in Bioinformatics – Irfan A. Khan, Atiya Khanum
4. Bioinformatics C. S.V Murthy
5. Bioinformatics D. Higgins and W.Taylor
6. Bioinformatics methods and protocols – Stephan Misener and Stephan A. Krawetz.

*Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
20215RMC26	Research Methodology	3	0	0	2

AIM:

To create a basic appreciation towards research process and awareness of various research publication

COURSE OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

COURSE OUTCOME:

- CO1 Understanding research questions and tools
- CO2 Experience in scientific writings
- CO3 Practice in various aspects of scientific publications
- CO4 Inculcation of research ethics

UNIT I:

Selection of problem-stages in the execution of research: choosing a topic to publication- preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, Bibliography. Journal ; standard of research journals – Impact factor.

UNIT II:

Measures of dispersion: Universe and population – delimiting population – sampling method – random sampling, stratified random sampling – types of variables: qualitative and quantitative variables – continuous and discontinuous variables – scaling method S- mean – standard deviation – standard error – coefficient of variation.

UNIT III:

Coparision of means, chisquard test, student test (ANOVA ‘’portioning of variation). F test – model sums on one way ANOVA with interpretation of data – introduction to MANIVA – Statistical and their use – significance test and fixing levels of significance – use of statistical software like COSTAT and STATISTICA. Breif introduction to pie and histograms. Use of LCD.

UNIT IV:

Chromatography – principle, operative technique and applications of paper, TLC, adsorption chromatography, GLC and HPLC. Ion-Exchange, molecular sieve, Electrophoretic techniques – principle and technique of gel, SDS, high voltage and discontinuous electrophoresis, Isoelectric focusing, pulsed field gel electrophoresis and capillary electrophoresis. Spectrometry – Centrifugation techniques.

UNIT V:

X-Rays – X-Ray diffraction, crystals and detectors, quantitative analysis and applications. Radio chemical methods – Basic concepts, counting methods and applications. Autoradiography, detection and measurement of radioactivity, applications of radioisotopes in biology.

*Employability/Entrepreneurship/Skill development

REFERENCES:

1. An introduction to practical biochemistry by David T. Plummer.
2. Laboratory Manual in Biochemistry by Pattabiraman and Acharya
3. Practical Biochemistry by J. Jayaraman.
4. Analytical Biochemistry, D. J. Homie and Hazel Peck, Longman group, 3rd edition, 1998.
5. Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2nd Edition 1999.
6. Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3rd 1999.
7. Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2nd edition, Pp 160, ISBN: 081208005
8. Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plagrove Macmillan, Pp256. ISBN 1403905843

Code	Course Title	L	T	P	C
20215SEC31	Molecular Biology	6	1	0	6

Aim:

Course on molecular Biology & genetics will enhance the knowledge base about functional and structural organization of nucleic acid.

Course objectives:

The course aims to provide students with a basic understanding of

- Organization of DNA in a genome and the mechanism behind replication, transcription and translation.
- Regulation of gene expression in prokaryotes and Eukaryotes.

Course outcomes (CO's):

- CO1 Understand the structure of nucleic acids and the DNA replication process
- CO2 Learn about the process of transcription
- CO3 Understand the mechanism of translation
- CO4 Learn about gene regulation in prokaryotes
- CO5 Study the discovery of DNA as genetic material, transcription, DNA repair and translation
- CO6 Analyse coding and non-coding regions of eukaryotic genome and their importance.
- CO7 Exposure with the importance of E. coli lac operon

UNIT-I

Structure and functions of DNA, Eukaryotic genome organization .DNA replication . DNA damage and repair . Gene arrangements . Recombination

UNIT-II

Prokaryotic and Eukaryotic RNA polymerases – structures and function Mechanism of prokaryotic and eukaryotic transcription. Regulation of gene expression-In prokaryotes- Operon concept ,Attenuation and termination . In Eukaryotes – hormonal (steroid hormone receptors) Phosphorylation (STAT proteins). Activation of transcription elongation by HIV Tat protein . Post transcriptional processing in prokaryotes and eukaryotes , Ribozymes, Antisense RNA.

UNIT –III

Genetic code- Translation in bacteria and eukaryotes. Translational control in bacteria and eukaryotes. Regulation of protein synthesis. Inhibitors of protein synthesis . Co and post

translational modifications. Protein targeting to membrane and organelles. Protein degradation – Protein folding

UNIT –IV

Levels of Gene expression. Principle of gene regulation , Cis acting elements and trans acting factors . Upregulation ,Down regulation, Induction ,Repression ,Global and narrow domain mechanisms. Comparison of gene regulation strategies in prokaryotes and eukaryotes. Epigenetic gene regulation by DNA methylation. Transposable elements .

UNIT –V

Mutation and mutagenesis – chemical and UV mutagenesis-types –Ames test-Bacterial genetic system – Transformation –Conjugation- Transduction. Development genetics – Overview. Drosophila development maternal effect gene ;zygotic genes .

*Employability/Skill development

REFERENCES :

1. Molecular Biology-Friefelder.
2. Molecular Cell Biology-Lodish
3. Molecular Biology of the cell- Bruce Albert.
4. Molecular Biology of the Gene – Watson.
5. Genomes-T.A. Brown.
6. Advanced Molecular Biology –R.M.Twmymann.

Course Code	Course Title	L	T	P	C
20215SEC32	Clinical Biochemistry	6	1	0	6

AIM:

Describe the principles of analytical measurement in Clinical Chemistry Identify the meaning and use of laboratory investigations in connection with diseases of the major organs and the systems

Course Objectives:

Clinical Chemistry are to enable the student to acquire the basic knowledge (theoretical and practical) to enable them to critically evaluate both the methodologies relevant to Clinical Chemistry and the meaning of the data obtained in relation to the pathological conditions.

Course Outcomes:

- CO1 To learn about the normal constituents of urine, blood and their significance in maintaining good health
- CO2 Exposure to the mechanisms of causation of diseases of liver and kidney.
- CO3 Develop understanding of the current concepts related to mechanism of Cancer
- CO4 To become aware with the variations in the levels of triglycerides and lipoproteins and their relationship with various diseases
- CO5 able to describe the diagnostic laboratory, according to the main stages pre-analytical, analytical and post-analytical
- CO6 describe the diagnostic significance of the main laboratory investigations know the problems related to the preparation of the patient, the collection and knowledge of the samples

UNIT-I

Disorder of blood –Sickle cell disease - hereditary methemoglobinemias-Thalassemias-Porphyrrias- Agranulocytosis, Thrombocytopenia, aplastic-hemolytic, Anemia, Hematuria, disorders of clotting mechanism.

UNIT –II

Inborn errors of metabolism – PKU – Tyrosinosis - Alkaptonuria – maple syrup urine disease – homocystinuria – histidinuria – albinism – parkinson’s diseases – Diseases involving lysine and ornithine – Folic acid deficiency – Clinical problems related to glutathione. Disorders of purine metabolism – lesch nyhan syndrome, immune deficiency

diseases , gout. Diabetes mellitus – lactic acidosis – G-6-PD deficiency- mucopolysaccharides – galactosemia – glycogen storage diseases

UNIT: III

Apolipoproteinuria and genetic abnormalities in lipid energy Transport – Lipid storage diseases – Fatty liver – causes– types and features – Atherosclerosis – Hypertension. Cerebrospinal fluid – protein concentration and gold curve – glucose and protein level in CSF under pathological condition.

UNIT: IV

Liver function test, metabolism of bilirubin, differential diagnosis of jaundice, hepatitis, cirrhosis and hepatic coma. Gastric analysis – acidity curves – stimulation tests- insulin and pentagastrin, peptic ulcer- gastritis and Zollinger-Ellison syndrome – gall stones

UNIT: V

Biochemical changes in pregnancy – menstrual cycle- hormonal changes – placental hormones – parturition - lactation – prenatal and postnatal diagnosis. Amniotic Fluid – origin , composition and analysis of amniotic acid

REFERENCES:

1. Text book of biochemistry with clinical correlations : T.M.Devlin.
2. Practical clinical biochemistry: H.Varley.
3. Principles and practice of medicine - Davidson.
4. An introduction to practical biochemistry- D.T.Plummer.
5. Clinical biochemistry – Marshall.
6. Text Book of medical biochemistry – Chatterjee.
7. Tietz text book of clinical chemistry.
8. Principles of internal medicine – Harrison's vol. I&II
9. Harper's biochemistry. McGraw Hill.

***Employability Skill development**

Course Code	Course Title	L	T	P	C
20215SEC33L	Clinical Biochemistry Lab	0	0	5	3

AIM:

Describe the principles of analytical measurement in Clinical Chemistry Identify the meaning and use of laboratory investigations in connection with diseases of the major organs and the systems

Course Objectives:

Clinical Chemistry are to enable the student to acquire the basic knowledge in practical to enable them to critically evaluate both the methodologies relevant to Clinical Chemistry

Course outcomes (CO's)

- CO1 Identify the principal analytical procedures used to measure biochemical magnitudes.
- CO2 Interpret and integrate the analytical data from the principal biochemical and molecular genetics tests for the screening, diagnosis, prognosis and monitoring of pathologies.
- CO3 Interpret experimental results and identify consistent and inconsistent elements.
- CO4 To introduce them to metabolic pathways of the major biomolecules and relevance to clinical conditions.
- CO5 Manage information and the organization and planning of work.
- CO6 To learn qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods.

EXPERIMENTS:

1. Urine qualitative Analysis- normal and abnormal constituents.
2. Blood- ESR, TC/DC, blood grouping, hemoglobin.
3. Quantitative analysis of blood- sugar, urea, uric acid, creatinine, TG, Cholesterol, HDL, phospholipids, calcium, iron, inorganic phosphorus, protein (biuret method), bilirubin, chloride.
4. Assay of serum enzyme- SGOT, SGPT, Acid phosphatase and Alkaline phosphatase, amylase.

*Employability/Skill development

REFERENCES:

1. Practical clinical biochemistry- Harold varley.

2. Text book clinical chemistry- Tietz.
3. Manuals in biochemistry – Dr.J.Jayaramam.
4. Manuals in biochemistry- Dr.S.Ramakrishnan.
5. Practical biochemistry- Plummer.

Course Code	Course Title	L	T	P	C
20215DSC34A	Genetics and Genetic Engineering	5	0	0	4

Aim:

To comprehend cellular mechanisms of developmental stages.

Course objective :

- Specific objectives of this course are to provide an understanding and discuss ramifications of inheritance, gene structure and function, gene mutation, and research related to genetics and its applications.

Course outcomes (CO's):

- CO1 Comprehensive, detailed understanding of the chemical basis of heredity
- CO2 Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- CO3 Comprehensive detailed understanding of cellular mechanisms of developmental stages.
- CO4 Exposure to the concepts of genomics, proteomics, metabolomics and their importance in human health
- CO5 Acquaintance with the merits and demerits of transgenic crops.
- CO6 To produce insulin using recombinant DNA technology.

UNIT- I

Overview of genetics; relation between genes and traits; mendelian genetics –three potulates- dihybrid cross-test cross-punnett squax-trihybrid cross-pedigree analysis-linkage-complete and incomplete linkage- crossing over-four crossing over-recombination frequencies-gene mapping in eukaryotes. Sex determination – sex chromosomes- klinefilter and turners syndrome- sex differentiation in humans- dosage compensation- barr bodies-sex linked epigenetic inheritance-gene mutations. Eugenics- gene interactions- pleiotropism.

UNIT – II

Population genetics- gene frequency-gene pool- hardy Weinberg equilibrium- allele frequencies- factors influencing – human cytogenetics. Evolutionary genetics- origin of species- genetic drift-polymorphism- natural selection- genetic code- genetic death- genetic homeostasis.

UNIT-III

Genetic engineering- overview-Analyzing DNA sequences- Maxam and Gilbert method,chain- terminator method and semi –automated method; southern and northern blotting – methods,merits and limitations ;polymerase chain reactions-basic principles ,types,special features and applications cutting and joining DNA molecules- nomenclature, target sites and applications;site- directed mutagenesis- cassette mutagenesis, primer extension and PCR- based mutagenesis.

UNIT- IV

Gene cloning- general strategies- cloning vehicles- plasmids, bacteriophages, cosmids, plasmids and YAC; shuttle and broad host range vectors; recombinant DNA and methods for introducing rDNA into host cells; screening: expression of cloned DNA; cloning in e-coli, bacillus subtilis and saccharomyces cerevisiae- merits and limitations; gene transfer into plants through Ti plasmids; transferring gene into animal cells- eggs and embryos.

UNIT-V

Transgenic plants- insect and herbicide resistant plants; transfer of Nif genes; transgenic animals- animal bioreactors, molecular farming and breeding strategies; genetic engineering in the production of insulin, somatostatin, vaccines and antibodies; gene therapy- types, methods and prevention of diseases; Manipulation of reproduction in animals.

REFERENCES BOOKS:

1. Text Book of medical biochemistry – M.N.Chatterjea
2. Endocrinology by Prakash S.K.Lokar
3. Physiological review of Biochemistry – Harper and others
4. Endocrinology – Turner
5. Invertebrate reproduction – K K Nayar
6. Text Book of endocrinology – Williams-

***Employability/Entrepreneurship/Skill development**

Course Code	Course Title	L	T	P	C
20215DSC34B	Pharmaceutical Biotechnology	5	0	0	4

Aim:

This course offers the students comprehensive information and insights in pharmaceutical biotechnology and the development of biopharmaceuticals in pharmaceutical industry.

Course Objectives:

- To facilitate the students to know the definite path of metabolism of drugs and drug discovery. The information gained will help the students to formulate novel drugs.

Course Outcomes (CO's):

- CO1 Understanding the importance of Immobilized enzymes in Pharmaceutical Industries.
- CO2 Genetic engineering applications in relation to production of pharmaceuticals
- CO3 This course gives information on drug designing, novel techniques in drug discovery and the role of biotechnology in pharmaceuticals.
- CO4 Importance of Monoclonal antibodies in Industries
- CO5 Appreciate the use of microorganisms in fermentation technology
- CO6 Exposure with the importance of expression vectors and their importance in Biotechnology.

Unit-I:

Definition and scope – potential and achievements – Fermentation technology and industrial microbiology Fermentation as a biochemical process, bioconversion and biotransformation.

Unit-II:

Fermented construction and working, downstream processing, fermentation monitoring, in-situ recovery of fermentation products, proof of efficacy of biotech products. General application of fermentation in the manufacturing of antibiotics (Pencillin, streptomycin, tetracycline) dextran, vitamin (Vit.B2 and Vit.B12).

Unit-III:

Microbial enzymes, microbial limit tests and assays (antibodies, Vitamin, amino acids etc.). standards of water used in fermentation, pharmaceutical and cosmetic industry.

Unit-IV:

Preparation and characteristics of immunologicals – Preparation and standardization of vaccines, sera, allergenic extracts, diagnostics, biologicals. Introduction to veterinary vaccines, immunomodulating substances, lymphokines, preparation of monoclonal antibodies, applications of monoclonal antibodies.

Unit-V:

Biotechnology derived products (therapeutic proteins) Examples of biotechnology derived therapeutic products of human Insulin, Interferon, somatostatin and somatotrapin.

REFERENCE BOOKS:

1. Bainse William, Biotechnology from A to Z, 2nd Edition, 2002, Oxford University Press.
2. Berger S.L., et. al., Methods in Enzymology, Academic Press Inc., CA 1992.
3. British Pharmacopoeia, 1993, London, HMSO.
4. Carter S.J., Cooper and Gunn's Tutorial Pharmacy, 6th Edition, 1996, CBS Publishers and Distributors, Delhi.
5. Casido L.E., Industrial Microbiology, 2000, New Age International, Delhi.
6. De Kalyan Kumar, Plant Tissue Culture, 1st Edition, 1997, New Central Bank Agency (P) Ltd.
7. Freifelder David, Molecular Biology, 2nd Edition, 1998, Narosa Publishing Home.
8. J.I.Disouza, Killaedar S.G., Biotechnology and Fermentation Process, Nirali Prakashan.

*Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
20211OEC	Open Elective -Writing for the Media	4	0	0	3

Aim:

To equip students to enter the realm of mass media.

Course Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Course Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news- Scoop- Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters- Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

***Skill development**

References-

- | | |
|----------------------------|--------------------------------------|
| Journalism | - Susan |
| Professional Journalism | - John Hogenberg |
| News Writing and Reporting | - M.James Neal (Surjeet Publication) |

Professional Journalism - M.V Komath
The Journalist's Handbook - M.V Komath
Mass Communication & Journalism - D.S Mehta,

Course Code	Course Title	L	T	P	C
20212OEC	Open Elective – Applicable Mathematical Techniques	4	0	0	3

Aim:

To acquaint with the basic concept of Interpolation.

Course Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Course Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

REFERENCES

Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman

Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

***Skill development**

Course Code	Course Title	L	T	P	C
20213OEC	Open elective Biomedical Instrumentation	4	0	0	3

Aim:

To understand the concepts and application of electronic Instrumentation in the Medical field.

Course Objective:

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

Course Outcomes:

- To familiarize students with various medical equipments and their technical aspects
- To introduce students to the measurements involved in some medical equipment.
- Ability to understand diagnosis and therapy related equipments
- Understanding the problem and ability to identify the necessity of an equipment to a specific problem

UNIT – I: Bio Electric Signals And Electrodes

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: Recording System And Recorders

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: Measurement And Analysis Techniques

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: Magnetic Resonance And Ultrasonic Imaging Systems

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological effects of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – medical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: Advanced Bio Medical Systems

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

***Skill development**

BOOKS FOR STUDY

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

BOOK FOR REFERENCE

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
20214OEC	Open Elective-Green Chemistry	4	0	0	3

Aim:

To reduce the soil and water pollution in environment.

Course Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Course Outcomes:

- To understand the environmental status and evolution.
 - To know about the Pollution and its prevention measures.
 - To familiarize the green chemistry.
 - To learn about the bio-catalytic reactions.
 - To understand about the vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house

effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

REFERENCES:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

***Skill development**

Course Code	Course Title	L	T	P	C
20222OEC	Open Elective –M- Marketing	4	0	0	2

Aim

Course OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

Course Outcome

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing - Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools - setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile - case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
3. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge University Press, 2001.

***Skill development**

Course Code	Course Title	L	T	P	C
20280OEC	Open Elective-Counselling Psychology	4	0	0	3

Aim:

- To acquaint with counselling and its process

Course Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Course Outcome:

- Learn counselling and its process

UNIT I

Definition of Counseling, Counseling as a Solution to Human Problems, Counseling - Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates, Social Determinates

UNIT III

Approaches to Counseling, Counseling Process

UNIT IV

Psychological Testing, Diagnosis

UNIT V

Educational Counseling, Family Counseling

REFERENCES BOOK:

1. Hanson, J.C. Stevic, R.R., Warner, R.W., Jr. Counselling Theory & Process (2nd Edition) Boston
2. Hurlock Elizabeth B.(2007), Human Development, New York, Grawhill Book Company
3. John W, Santrock (1999), Life Span Development, 7th Edition, New Delhi; Mcgrowhill Company
4. blum And Bolinsky, B. Counselling & Psychology; Bomboy; Asia Publishing House, 1961
5. Bordin, E.S. Psychology Of Counselling New York; Application Century Crafts, 1968
6. Lewis E. C., The Psychology Of Counselling New York Holt, Rinchart And Winston Inc. 1970

***Skill development**

SEMESTER IV

Course Code	Course Title	L	T	P	C
20215SEC41	Molecular Basis of diseases	6	0	0	6

Aim: This paper provides a thorough knowledge about molecular structure and function of cells, molecular mechanism of diseases.

Course objectives:

The syllabi of Molecular compliments and supplements the necessary knowledge students have gained in Physiology. Consequently it incorporates topics like Drug resistance, inflammation, Vaccines, cellular ageing and other infectious diseases. It also provides the necessary inputs for the other disciplines like Pharmacology, social and preventive medicine, medicinal biochemistry etc.

Course outcomes: After the completion of this course, the student will be able to

- CO1 Attain a thorough knowledge on the molecular mechanisms for Tuberculosis, Typhoid, Cholera
- CO2 Understand the pathological changes during infectious diseases.
- CO3 Provide an insight into the history of pathology covering all the basic definitions and common terms.
- CO4 Detail on the survival mechanism in diseases, an insight into microscopic and cellular pathology.
- CO5 Elaborate the overview of Dengue Hemorrhagic Fever, and Chlamydiae, opportunistic fungal pathogens
- CO6 review the causes and mechanisms of Emerging and re-emerging infectious diseases and pathogens

UNIT I:

Overview of infectious diseases, infectious agents - Bacteria, Viruses, protozoa and fungi, pathogenicity and virulence; Facultative / obligate intracellular pathogens.

UNIT II:

Emerging and re-emerging infectious diseases and pathogens including X-MDR M. tuberculosis, MRSA, SARS virus, Bird flu, prions, AIDS, Dengue Hemorrhagic Fever, and Chlamydiae, opportunistic fungal pathogens.

UNIT III:

Viral diseases, epidemiology, signs and symptoms, causative agent, history, infection and pathogenesis, Detection, Drugs and inhibitors, Vaccines, molecular mechanisms for AIDS, hepatitis, influenza, dengue, polio, herpes.

UNIT IV:

Bacterial disease, epidemiology, signs and symptoms, causative agent, history, infection and pathogenicity, Diagnostics, Therapeutics and vaccines. Drug resistance, mechanisms, Multidrug efflux pumps, extended spectrum β -lactamases (ESBL) and implications on public health, molecular mechanisms for Tuberculosis, Typhoid, Cholera.

UNIT V:

Parasitic diseases epidemiology, signs and symptoms, causative agents, history, Vectors, life cycle, Host parasite interactions, Diagnostics, Drugs and Inhibitors, Resistance, Vaccine development, molecular mechanisms for Malaria.

*Employability/Entrepreneurship/Skill development

REFERENCES

1. Klein's Microbiology (2008) 7th Ed., Prescott, Harley, Willey, J.M., Sherwood, L.M., Woolverton, C.J. Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.
2. Principles and practices of Infectious diseases, 7th edition, Mandell, Douglas and Bennett. S, Volume, 2. Churchill Livingstone Elsevier. ISBN: 978-0-443-06839-3
3. Sherris Medical Microbiology: An Introduction to Infectious Diseases. (2010). Kenneth J. Ryan, C. George Ray, Publisher: McGraw-Hill. ISBN-13: 978-0071604024 ISBN-10: 0071604022
4. Medical Microbiology. (2012). Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier Health Sciences. ISBN: 978-0-323-08692-9.
5. Bacterial Pathogenesis: A molecular approach by Salyers AA and Whitt DD eds. American Society for Microbiology Press, Washington, DC USA. 2002

Course Code	Course Title	L	T	P	C
20215SEC42	Environmental Biochemistry	6	1	0	6

Aim : To understand the fundamental chemical principles that govern complex biological systems.

Course objective: To provide knowledge about biochemistry of environmental processes and ecology.

Course outcomes

- CO1 students will be able to explain fundamentals of earth atmosphere and its interconnectivity between various components.
- CO2 students will be able to describe different elements of the environments and their impact on sustaining the environment.
- CO3 students will be able to interpret the fundamentals of ecology and its role in biological evolution
- CO4 Gain knowledge about pollution control
- CO5 understand the importance of Structure and functions of ecosystem
- CO6 exposure with the importance of Value of Biodiversity

UNIT I

Definition, scope and importance. Concept of an ecosystem. Structure and functions of ecosystem. Producers, consumers and decomposers. Energy flow in an ecosystem. Ecological succession. Food chains, food webs and ecological pyramids Introduction, types, characteristic features, structure and function of the following ecosystem. Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (Pond, streams, lakes, rivers, oceans, estuaries.)

UNIT II

Causes, effects and control measure of, Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal Pollution, Bioremediation.

UNIT III

Introduction – Definition, genetic, species and ecosystem diversity. Value of Biodiversity : Consumptive use, Productive uses social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. Hot spots of biodiversity, Threats to biodiversity Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT IV

Enzymes: Immobilization of enzymes, enzymes engineering ,isolation and culturing of microorganisms, production of enzymes ,fermentation ,antibiotics, use of microbes to treat sewage water and industrial effluents and mining.

UNIT V

Pollution Control: Cleaner technologies, reducing environment impact of industrial effluents, chemical pesticides, herbicides and fertilizers. Renewable source of energy through through waste materials; biogas, energy crops, cellulose current levels of biodiversity and gene banks.

***Employability//Skill development**

REFERENCES: 1. Elements of biotechnology, P.K.Gupta, Rastogi and Company, Meerut, India.

2. An Introduction to Genetic Engineering, Desmond S.T.Nicoll-Cambridge University.

3. Biotechnology, Kesar, Trehar Wiley, Eastern India.

4. Microbiology, Michael Pelczar, Tata-Mc Graw Hill Publishing Company, New Delhi.

5. Recombinant DNA-a short course, J.D.Watson, Scientific American Bank.

Course Code	Course Title	L	T	P	C
20215SEC43L	Molecular and Environmental Biochemistry lab	0	0	5	3

AIM: This paper to study in laboratory techniques in both molecular biology and environmental biochemistry, and be able to apply the scientific method to the processes of experimentation and Hypothesis testing.

COURSE OBJECTIVES: The course aims

- to develop skills of performing basic molecular and environmental biochemical tests important in clinical investigations,
- to develop familiarity with molecular and biochemical laboratory techniques, and
- to introduce students to various practical aspects of molecular biology and their correlation in disease conditions.

COURSE OUTCOMES:

- CO1 After the completion of this course, the student will be able to Learn how to isolate genomic DNA.
- CO2 Track various techniques adopted for separation of DNA.
- CO3 Demonstrate separation of protein by Western blotting and Animal Tissue culture.
- CO4 Separate chromosomal and plasmid DNA using enzyme.
- CO5 Gain the knowledge about COD and BOD
- CO6 demonstrate basis of Animal tissue culture

EXPERIMENTS:

1. Isolation & Purification of genomic DNA from bacteria
2. Isolation & Purification of plasmid DNA
3. Agarose gel electrophoresis of chromosomal & plasmid DNA
4. Restriction Digestion of chromosomal & plasmid DNA
5. Isolation of DNA fragment from agarose gel
6. Western blotting (Demonstration only).

7. Animal tissue culture (demonstration only).
8. Determination of BOD and COD form contaminated water
9. Bacterial examination of drinking water by MPN techniques

REFERENCE

1. J Sambrook & D. W. Russell (2001). Molecular cloning: a laboratory manual Vol 1,2 & 3, CSHL Press.
2. Principles and Techniques of Biochemistry and Molecular Biology, K. Wilson and J. Walker (2006), Cambridge University Press
3. Molecular Biomethods Handbook, J.M. Walker (2008), Humana Press.
4. Molecular Cloning: A Laboratory Manual (1989), 2nd ed.. Cold Spring Harbor Laboratory Press

*Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
20215DSC44A	Medical Biotechnology	5	0	0	4

AIM: This paper provide the information about History and scope of medical biotechnology, current status and future prospects.

Course Objectives:

- To enlighten the knowledge of the Students on different areas of Medical Biotechnology.
- To train the Students in a hospital based setup and familiarize them with the clinical diagnostics of diseases.

Course Outcomes:

- CO1 Explain insights about genetic diseases and also about the molecular aspects related to human disease
- CO2 Gain new insights into molecular mechanisms of nucleic acid and gene therapy
- CO3 Gain knowledge about therapeutic recombinant proteins and immunotherapy for the treatment of different diseases
- CO4 understand then Nucleic acid based Therapy
- CO5 exposure with Gene therapy
- CO6 able to interpret the molecular basis of diseases

Unit I:

Classification of genetic diseases: Chromosomal disorders – Numerical disorders e.g. trisomies & monosomies, Structural disorders e.g deletions, duplications, translocations & inversions, Chromosomal instability syndromes. Gene controlled diseases – Autosomal and X-linked disorders, Mitochondrial disorders.

Unit II:

Molecular basis of human diseases: - Pathogenic mutations Gain of function mutations: Oncogenes, Huntingtons Disease, Pittsburg variant of alpha 1 antitrypsin. Loss of function - Tumour Suppressor. Genomic. Dynamic Mutations - Fragile- X syndrome, Myotonic dystrophy. Mitochondrial diseases

Unit III:

Gene therapy: Ex-vivo, In vivo, In situ gene therapy, Strategies of gene therapy: gene augmentation Vectors used in gene therapy Biological vectors – retrovirus, adenoviruses, Herpes Synthetic vectors– liposomes, receptor mediated gene transfer. Gene therapy trials – Familial Hypercholesterolemia, ADA, AIDS, Cystic Fibrosis, Solid tumors.

Unit IV:

Nucleic acid based Therapy: Gene silencing technology, siRNA, Aptamers, antisense oligodeoxynucleotides (AS-ODN), Ribozymes, Peptide Nucleic Acids, Clinical management and Metabolic syndrome: – PKU, Familial Hypercholesterolemia, Rickets, ADA, Congenital hypothyroidism.

UNIT V:

Recombinant & Immunotherapy; Clinical applications of recombinant technology; Erythropoietin; Insulin analogs and its role in diabetes; Recombinant human growth hormone; Streptokinase and urokinase in thrombosis; Recombinant coagulation factors, Monoclonal antibodies and their role in cancer; Role of recombinant interferons; Immunostimulants; Immunosuppressors in organ transplants; Role of cytokine therapy in cancers;

***Employability//Skill development**

REFERENCE

1. Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (2000)
2. Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine) by Jochen Decker, U. Reischl Amazon
3. Human Molecular Genetics by T. Strachan, Andrew Read Amazon Sales Rank
4. Culture of Animal Cells- A manual of basic techniques by R.I. Freshney
5. Barry R Bloom, Paul-Henri Lambert 2002. The Vaccine Book. Academic Press
6. Lodish et al., Molecular cell Biology, 4th Edition, W.H. Freeman & Company, 2000.
7. Smith & Wood, Cell Biology, 2nd Edition, Chapman & Hall, London, 1996.
8. Watson et al., Molecular Biology of the gene, 5th Edition, Pearson Prentice Hall. USA, 2003

9. Levine MM, Kaper JB, Rappuoli R, Liu MA, Good MF. 2004. The new generation vaccines. 3 rd Ed. Informa Healthcare.
10. Lowrie DB & Whalen R. 2000. DNA Vaccines. Humana Press.

Course Code	Course Title	L	T	P	C
20215DSC44B	Applied Microbial Biochemistry	5	0	0	4

AIM:

Students will gain knowledge about different energy sources such as inorganic compounds, organic compounds and visible radiation for organisms.

COURSE OBJECTIVES:

- To provide knowledge about microbial culture techniques.
- To learn the concepts of different energy sources.
- To provide knowledge about industrial application of microbes.

COURSE OUTCOME:

- CO1 Will be acquainted with methods of measuring microbial growth, calculating growth kinetic parameters with understanding of steady state and continuous growth.
- CO2 Will have gained an in-depth knowledge of primary, secondary and group translocation transport systems existing in bacteria, simultaneously learning membrane transport proteins and kinetics of solute transport.
- CO3 Will have learnt central metabolic pathways for carbon metabolism in bacteria enlisting differences with eukaryotic systems and their regulation in diverse physiological conditions. This allows students to apply the acquired knowledge in engineering metabolic pathways for developing industrially useful strains.
- CO4 Will have gathered understanding of inorganic and organic nitrogen assimilation and its regulation. Also knows role of glutathione in cellular redox regulation and biochemistry of glutamate overproducing strains.
- CO5 will have learnt Microbial products in pharmaceutical and agriculture industry
- CO6 exposure with Medical microbiology and microbial metabolism

Unit-I: Microbiological techniques

Culture techniques: Isolation of microbes from various sources, serial dilution techniques, pure culture techniques, anaerobic culture methods – chemical and physical methods. Culture preservation techniques. Nutritional requirements: - different kinds of media, composition of media-carbon sources, nitrogen sources, vitamin and growth factors, mineral, inducers, precursors and inhibitors. Sterilization methods.

Unit-II: Sources of energy

Energy from inorganic compounds - ET in chemolithotrophs, production of reducing power in chemolithotrophs; Energy from visible radiation – photosynthesis in eukaryotes, blue-green algae, bacteria. Bioenergy: Renewable and non-renewable energy sources – Green technology - Biofuels, biogas, bioethanol.

Unit III- Microbial metabolism-

Overview. Photosynthesis in microbes. Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. Chemolithotrophy; Hydrogen– iron– nitrite oxidising bacteria; nitrate and sulfate reduction; methanogenesis and acetogenesis, fermentations– diversity, syntrophy-role of anoxic decompositions. Nitrogen metabolism, nitrogen fixation, hydrocarbon transformation.

Unit-IV: Medical microbiology

Infectious Diseases process – Diagnosis – Process of sample collection, transport and examinations of the specimens. Antibioassay. Bacteriology: Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of Gram positive organisms - Staphylococcus aureus, Mycoplasma; Gram negative organisms: E. coli. Infections, antimicrobial agents for textiles, international standards for the assessment of antimicrobial activity of textiles.

Unit-V: Microbial products in pharmaceutical and agriculture industry:

Production, harvest, recovery and uses– Enzymes, Antibiotics (Penicillins, Tetracycline), vitamins (B2, B12), Aminoacids (lysine, glutamic

***Employability/Skill development**

REFERENCE BOOKS:

1. Pelczar, M.J., Chan, E.C. and Krieg, N.R. (2006) Microbiology, 6th Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Prescott (2008), Microbiology, 7th edition, McGraw Hill International Edition, New York.
3. Tortora, G.J., Funke, B.R. and Case, C.L. (2009) Microbiology, 2nd edition, Pearson Education, Inc.
4. Talaro, K.P. and Talaro, A. (2008) Foundations in Microbiology, Tata McGraw Hill Publishers, New York.
5. Yuan Gao and Robin Cranston. Recent Advances in Antimicrobial Treatments of Textiles, Textile Research Journal, 2008 78: 60. SAGE publications.
6. Microbiology 4th ed- Davis, Lippincott Williams and Wilkins, 1989.

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

**B.Sc. BIOTECHNOLOGY
CURRICULUM**

REGULATION 2020



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SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

B.sc., CURRICULUM - REGULATION-2020

B.sc., Graduate Attributes

- Research, inquiry and analytical thinking abilities.
- Capability and motivation for intellectual development.
- Ethical, social and professional understanding.
- Communication in intra and inter disciplinary
- Teamwork, collaborative and management skills in scientific research •
Information literacy in respective discipline

B.sc., Program Educational Objectives PEO

- **PEO 1** : To obtain detailed information about the fundamentals of Biotechnology, allied subjects and life skills.
- **PEO 2** : To provide information about the molecular methods which are involved in cellular processes of living systems such as microbes to higher order organisms for applied aspects. To address the emerging need for skilled scientific manpower with research ethics involving organisms.
- **PEO 3** : To impart the basics and current molecular tools in the areas of Molecular Diagnostics, Fermentation Technology, Plant, Animal & Environmental Biotechnology are included to train the students for man power development and also sensitize them to scope for research. The practical subjects will provide information about the careers in the industry and applied research where the biological system is employed.
- **PEO 4** : To make the graduates of Biotechnology to learn and to adopt in a competitive world of technology update and contribute to all forms of life •
PEO5- To enable them to execute a research objective through experimentation

B.Sc., Programme Specific Outcome (PSO)

- **PSO1**- Graduates will exhibit contemporary knowledge in Biotechnology and students will be eligible for doing jobs in pharmaceutical and biotechnological Industry.
- **PSO2**-An expert in biotechnology and allied fields (medical, microbial, agricultural, environmental, plant and animal) for utilizing the practical skill to address biotechnological challenges.
- **PSO3**- Graduates will be able to work individually as well as in team to survive in multidisciplinary environment.
- **PSO4**- If students will engage themselves in the process of effective learning, it will give opportunities to utilize acquired knowledge for the catering the needs of science and technology as well as for the betterment of human mankind.

- **PSO5**-Graduates will be able to understand the potentials, and impact of biotechnological innovations on environment and their implementation for finding sustainable solution to issues pertaining to environment, health sector, agriculture, etc.

B.Sc., Program Outcome PO

- **PO1**-Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life
- **PO2**-Understanding and better knowledge of the causes, types and control methods for environmental pollution by the students.
- **PO3**-The student will be able to discuss the mechanisms associated with gene expression system in prokaryotes and eukaryotes.
- **PO4**-Developed various communication skills such as reading, listening, speaking etc.,
- **PO5**-Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments
- **PO6**-Ethics: Convey and practice social, environmental and biological ethics.
- **PO7**-To get knowledge about research tools and learn to do review literature. Ability to carry out independent literature survey corresponding to the specific publications type and asses basic research tool



SCHOOL OF ARTS AND SCIENCE

B. Sc., BIOTECHNOLOGY REGULATION- 2020

EMPLOYABILITY

SKILL DEVELOPMENT

ENTREPRENEURSHIP

EMPLOYABILITY/ SKILL DEVELOPMENT/ENTREPRENEURSHIP

COURSE STRUCTURE

SEMESTER I					
Course Code	Course Title	L	T	P	C
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I)	4	0	0	2
20111AEC12	English-I	4	0	0	2
20117AEC13	Fundamentals of Biological System	6	1	0	5
20115AEC14A	Biological Chemistry	6	1	0	4
PRACTICAL					
20117AEC15L	Fundamentals of Biological System Lab	0	0	3	2
20115AEC16AL	Biological Chemistry Lab	0	0	3	2
	Total	20	2	6	17
AUDIT COURSE					
201ACLSICN	Indian Constitution	0	0	0	2
201ACLSUHV	Universal Human Values	0	0	0	2
SEMESTER – II					

Course Code	Course Title	L	T	P	C
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
20111AEC22	English-II	4	0	0	2
20117AEC23	Cell Biology and Genetics	6	1	0	5
20116AEC24	Microbiology	6	1	0	4
PRACTICAL					
20117AEC25L	Cell Biology and Genetics Lab	0	0	3	2
20116AEC26L	Microbiology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20117RLC27	Research LED Seminar	-	-	-	1
	Total	20	2	6	18
AUDIT COURSE					
201ACLSCOS	Communication Skills	-	-	-	2

201ACSSBBE	Basic Behavioral Etiquette	-	-	-	2
SEMESTER – III					
Course Code	Course Title	L	T	P	C
THEORY					
20110AEC31/ 20111AEC31/ 20132AEC31/ 20135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
20111AEC32	English-III	4	0	0	2
20117AEC33	Plant Physiology	4	1	0	4
20117AEC34	Immunology	4	1	0	5
PRACTICAL					
20117AEC35L	Plant Physiology Lab	0	0	3	2
20117AEC36L	Immunology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20117RMC37	Research Methodology	2	0	0	2

	Total	18	2	6	19
AUDIT COURSE					
201ACLSOAN	Office Automation	-	-	-	2
SEMESTER – IV					
Course Code	Course Title	L	T	P	C
THEORY					
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20117AEC43	Animal Physiology	4	1	0	4
20117AEC44	Molecular Biology	5	1	0	5
201ENSTU45	Environmental studies	2	0	0	2
PRACTICAL					
20117AEC46L	Animal Physiology Lab	0	0	3	2
20117AEC47L	Molecular Biology Lab	0	0	3	2
	Total	19	2	6	17
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	2
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	2
SEMESTER – V					
Course Code	Course Title	L	T	P	C
THEORY					
20117AEC51	Food and Agricultural Biotechnology	4	1	0	4
20117AEC52	Cell and Tissue Culture	4	1	0	3
20117AEC53	Industrial Biotechnology	4	1	0	4
20117DSC54	Discipline Specific Elective - I	4	1	0	3
PRACTICAL					
20117AEC55L	Food and Agricultural Biotechnology, Tissue Culture Lab	0	0	3	
20117AEC56L	Industrial Biotechnology Lab	0	0	3	2
3721 RESEARCH SKILL BASED COURSE					

20117BRC57	Participation in Bounded Research	-	-	-	
	Total	16	4	6	19
AUDIT COURSE					
201ACLSPSL	Professional Skills	0	0	0	2
SEMESTER – VI					
Course Code	Course Title	L	T	P	C
THEORY					
20117AEC61	Plant and animal Biotechnology	4	1	0	4
20117SEC62	Applied Biotechnology	4	1	0	5
20117DSC63	Discipline Specific Elective - II	4	1	0	3
201--OEC (2 DIGIT COURSE Name)	Open Elective	4	0	0	2
PRACTICAL					
20117SEC64L	Plant and Animal Biotechnology Lab	0	0	3	2
20117AEC65L	Applied Biotechnology Lab	0	0	3	2
20117PRW66	Project Work	-	-	-	4
20117PROPEE	Programme Exit Examination	-	-	-	1
	Total	16	3	6	23
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	2
201ACLSCET	Community Engagement	-	-	-	1
Total Credits for the Programme					115
Total Credits - Audit Courses					19

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 20117DSC54A - Bioinformatics and Biostatistics b) 20117DSC54B – rDNA Technology
	Discipline Specific Elective Courses-II
VI	a)20117DSC63A -Environmental Biotechnology b)20117DSC63B - Environmental Management

Semester	Open Elective Courses
VI	a) 201TNOEC-Tamil Ilakkiya Varalaru b) 201ENOEC-Journalism c) 201MAOEC-Development of Mathematical Skills d) 201PHOEC-Instrumentation e) 201CEOEC-Food and Adulteration f) 201CSOEC – E-Learning g) 201CAOEC-Web Technology h) 201CMOEC-Banking service

Credit Distribution

Sem	AEC	SEC	DS C	OEC	Research	Others	Total
I	17	-	-	-	-	-	17
II	17	-	-	-	1	-	18
III	17	-	-	-	2	-	19
IV	17	-	-	-	-	2	19
V	15	-	3	-	1	-	19
VI	6	7	3	2	4	1	23
Total	89	7	6	2	8	3	115

SEMESTER I

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

தமிழ்

செய்யுள், சங்க இலக்கியம், அற இலக்கியம், செம்பொளி, இலக்கிய வரலாறு

அலகு - 1: பரிபாடல் இலக்கியம் - நற்றிணை.

1. நெடும் - நெடிகூறல் - பாடல் எண் 11
 2. குறிஞ்சி - நெடிகூறல் - பாடல் எண் 64
 3. யாழ்ப்பாண - நெடிகூறல் - பாடல் எண் 141
 4. பாலை - நெடிகூறல் - பாடல் எண் 24
 5. மருதம் - நெடிகூறல் - பாடல் எண் 70

பரிபாடல் இலக்கியம் அறுந்கொடை

1. குறிஞ்சி - நெடிகூறல் - பாடல் எண் 1
 2. மலை - செவ்வந்திய கூறல் - பாடல் எண் 127
 3. மருதம் - நெடிகூறல் - பாடல் எண் 181
 4. நெடும் - நெடிகூறல் - பாடல் எண் 249
 5. பாலை - நெடிகூறல் - பாடல் எண் 347

பரிபாடல் இலக்கியம் எட்டுந்கொடை

1. மருதம் - களவல் பத்த - முதல் இரண்டு பாடல்கள்
 2. நெடும் - நெடிகூறல் பத்த - முதல் இரண்டு பாடல்கள்
 3. குறிஞ்சி - குறிஞ்சி குறவல் பத்த - முதல் இரண்டு பாடல்கள்
 4. பாலை - இளவல் பத்த - முதல் இரண்டு பாடல்கள்
 5. மலை - பாசல் பத்த - முதல் இரண்டு பாடல்கள்

அலகு - 2: கவிந்கொடை

1. பாலை - பாடல் எண் 1
 2. குறிஞ்சி - பாடல் எண் 27

அகநானூறு

1. பாலை - பாடல் எண் 1
 2. மருதம் - பாடல் எண் 4

புறநானூறு

பாடல் எண் 1, 121, 42, 155, 175, 194, 213, 249, 254, 255

பதிற்றுப்பத்து

இளவல் பத்த பாடல் எண் 4 (கிளம் நீர் லரி கிளம்)

அலகு - 3:

1. பட்டினப்பாலை - முதல் 10 வரிகள்
 2. திருக்குறள் - பத்திரிகைகளில் முதல் பகுதி 1-104

அலகு - 4: செம்பொளி வரலாறு

மொழி - விளக்கம், மொழிகளும் புகள் உட்கர் செம்பொளிகள், தந்தியர் செம்பொளிகள், செம்பொளித் தந்திகள், வரலாறுகள், வாய்மையில் செம்பொளி, தொல்காப்பியம், தமிழின் சிறப்புகள், தமிழ் செம்பொளி நூல்கள்

அலகு - 5: இலக்கிய வரலாறு

சங்க இலக்கியங்கள், பதினெண்மீட்டாளர்களுடைய

Employability

Course Code	Course Title	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms •
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT – I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

English for writers and translators -Robin Macpherson

Technical Communication -Meenakshi Sharma & Sangeetha Sharma The World's

Great Speeches - Sudhir Kumar Sharma Galaxy Publishers English Work Book-I&II

-Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature

UNIT –I

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason **UNIT – II**

The Merchant of Death -Nanda Kishore Mishra & John Kennet She Spoke for all Nature

-Young world 'The Hindu' **UNIT –III**

Because I could not Stop for Death -Emily Dickinson Stopping by

Woods on a Snowy Evening -Robert Frost

UNIT –IV

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –V

Oliver Twist -Charles Dickens

References:-

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan
Emerald Publishers

Course Code	Course Title	L	T	P	C
20117AEC13	Fundamentals of Biological system	6	1	0	5

Aim:

- To study the diversity of life, the interactions of the environment, to study problems, and to propose solutions to those problems.

Objectives:

- (Science: psychology) Perceptible to the external senses.
- (Science: ophthalmology) The lens or system of lenses in a microscope (or telescope) that is nearest to the object under examination

Outcomes :

- Understand the physical, chemical, and mathematical basis of biolog •
Appreciate the different scales of biological systems

UNIT – I

Diversity of Life: evolution and organization of life- living and non-living things-prokaryotes and eukaryotes- Classification of Microorganisms, Nomenclature, Endosymbiotic theory

UNIT II

Inorganic perspective of life: Elements Are Fundamental Types of Matter-Bonding-types, chemical reactions and concept of equilibrium, colligative properties of solution, laws of thermodynamics, bonding, water as an essential to life-properties Organisms Balance Acids pH scale Abiogenesis

UNIT III

Energy of Life- Biomolecules: carbohydrates, proteins, lipids and Nucleic acids classification- general properties- functions, Metabolism-Regulation of Metabolism Enzymes.

UNIT IV

Cellular organization of life: cell theory- cell organization-cell organelles- plant and animal cell- tissue organization- cell size and its constraints- movement in and out of the cell, Cellular Respiration-Bacteria, Plants and animals.

UNIT V

Biology of environment: biotic and abiotic factors- influence of environmental factors on life major biogeo cycles-carbon, nitrogen, oxygen cycles- ecosystems- food web- food chain and pyramids.

REFERENCE

1. Biology 2nd edition, George H. Fried and George J. Hademenos, Tata MacGraw Hill Publishers.
2. Biology: Concepts and Investigations, Third EDITION. By Marielle Hoefnagels 2012. McGraw-Hill.
3. Biology, By Mader, Sylvia S, Tenth Edition, 2010. McGraw-Hill.

Code	Course Title	L	T	P	C
20115AEC14A	Biological Chemistry	6	1	0	4

Aim:

- To understanding on the underlying principles of Biomolecules

Objectives:

- This course is designed to provide clear understanding on the underlying principles of structures and functions of biomolecules to the students of the subjects.

Outcomes:

- The learners will acquire knowledge on the structure and functions relationship of proteins nucleic acid carbohydrates and as well their roll in various biological process.

UNIT I

Carbohydrates : definition- classification- monosaccharide – structure , function and biological significance- disaccharides- polysaccharides- types and biological importance carbohydrate metabolism- glycolysis- TCA cycle- HMP shunt- glycogenesis- glycogenolysis oxidative phosphorylation.

UNIT II

Amino acids and proteins: amino acid classification- essential and non-essential amino acids structure and properties- proteins- definition- classification- functions- protein metabolism deamination – decarboxylation- transamination of amino acids- urea cycle.

UNIT III

Lipids: classification- physical and chemical properties- saturated and unsaturated fatty acids structure of cell membrane- fluid mosaic model- lipid metabolism- beta oxidation biosynthesis of saturated fatty acids.

UNIT IV

Nucleic acids: Nucleoside, Nucleotide, DNA- Base composition, double helical structure, RNA - Types.

UNIT V

Vitamins, minerals and hormones: classification – occurrence- deficiency symptoms biochemical functions.

REFERENCES

- BioChemistry by Jain, 2005. Chand Publications.
- Biochemistry by Voet and Voet.
- Biochemistry by L.Stryer

Course Code	Course Title	L	T	P	C
20117AEC15L	Fundamentals of Biological system Lab	0	0	3	2

Aim:

- To understanding The biological natural theory, characters and futures of some biological techniques

Objectives:

- The foundation of biology as it exists today is based on five basic principles. They are the cell theory, gene theory, evolution, homeostasis, and laws of thermodynamics.
Cell Theory

Outcomes:

- The learners will acquire knowledge on the structure and functions relationship of biological system and as well their roll in various biological process.

EXPERIMENTS

- Microscopic techniques- types
- Observation of prokaryotic and eukaryotic cells
- Living cell / temporary/ permanent preparations histochemical techniques •
Staining procedure *in vivo* and *in vitro*, living and non-living
- Different types of cells and tissues
- Taxonomical identification of any 2 plants
- Species diversity studies- any 2 methods
- Study of representative animals for each group
- Plankton analysis

REFERENCE:

1. Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.

Course Code	Course Title	L	T	P	C
20115AEC16AL	Biological Chemistry Lab	0	0	3	2

Aim:

- To understand the molecular orbital theory, preparation and properties of inorganic compounds.

Objectives:

- Theory of covalent bond, polar effects and stereochemistry of organic compounds.
- About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment

Outcomes:

- The molecular orbital theory, preparation and properties of inorganic compounds
 - Theory of covalent bond, polar effects and stereochemistry of organic compounds
- Elements of photochemistry, chemical kinetics and chromatography.

EX:

- Preparation of buffers
- Preparation of solutions of various dilutions.
- Estimation of carbohydrates.
- Estimation of proteins.
- Estimation of lipids.
- Qualitative analysis of carbohydrates
- Qualitative analysis of amino acids.
- Separation of amino acids by TLC method.
- Estimation of pH

REFERENCES:

- Biochemical methods II Edition Sadasivam, A. and Manickam, A. New age international P ltd. Publishers.

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitution	-	-	-	2

Objectives:

1. To make the students understand about the democratic rule and parliamentary administration
 2. To appreciate the salient features of the Indian constitution
 3. To know the fundamental rights and constitutional remedies
 4. To make familiar with powers and positions of the union executive, union parliament and the Supreme Court
- To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Unit I: The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion-cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

- 1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
- 2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.
- 3) Markandan. k.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, ourparliament, National book trust, New Delhi 1989

Learning Out comes:

1. Democratic values and citizenship training are gained
2. Awareness on fundamental rights are established
3. The function of union government and state government are learnt
4. The power and functions of the judiciary are learnt thoroughly
5. Appreciation of democratic parliamentary rule is learnt

UNIVERSAL HUMAN VALUES

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integral manner, without ignoring other aspects that are needed for learner's personality development.

Course Objectives :

The present course deals with meaning, purpose and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Course Outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit I

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
 - Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn/gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
 - Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Casestudies

Unit II

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
 - Learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit III

- Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence • Simulated situations
- Casestudies

Unit IV

- Introduction: What is righteousness?
 - Righteousness and *dharma*, Righteousness and Propriety
 - Individuals who are remembered in history for practicing righteousness • Narratives and anecdotes from history, literature including local folklore • Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
 - Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Unit V

- Introduction: What is peace? Its need, relation with harmony and balance • Individuals and organisations that are known for their commitment to peace • Narratives and Anecdotes about peace from history, and literature including local folklore
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace • Simulated situations
- Casestudies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.
- Individuals who are remembered in history for practicing this value. • Narratives and anecdotes dealing with instances of service from history, literature including local folklore
 - Practicing service: What will learners learn/gain if they practice service? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s) regarding service • Simulated situations
- Casestudies

Unit VII

- Introduction: What is renunciation? Renunciation and sacrifice. Self restraint and Ways of overcoming greed. Renunciation with action as true renunciation

- Individuals who are remembered in history for practicing this value. •
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Course Code	Course Title	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations •
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT –I

E-mail

Fax

Memos

UNIT – II

Itinerary

Checklist

UNIT – III

Invitation

Circular

UNIT – IV

Instruction

Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

SKILL DEVELOPMENT

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Technical Communication -Meenakshi Sharma & Sangeetha Sharma Inspiring

Lives -Maruthi Publishers

English Work Book-I&II -Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To empower students to acquire language skills through literature •
To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – I

Ecology -A.K. Ramanujan Gift -Alice Walker

The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans

Asleep -Ernst Jandl

Buying and selling -Khalil Gibran **UNIT –III**

The End of living and The Beginning of Survival - Chief Seattle

My Wood - E.M.Forster

The Meeting of Races - Rabindranath Tagore **UNIT – IV**

The Refugee -K.A. Abbas

I Have a Dream -Martin Luther king Those People Next Door -A.G.

Gardiner **UNIT – V**

Marriage is a private Affair -Chinua Achebe The Fortune Teller

-Karel Capek

Proposal

-Anton Chekov

References:-

Gathered Wisdom -GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
20117AEC23	Cell biology and genetics	6	1	0	5

Aim:

- Students will understand the cellular components underlying mitotic cell division.

Objectives:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells

Outcomes:

- This paper will enable the students to learn the basics and lay strong foundation in understanding the composition of cells, how cells works is fundamental to living systems.s

UNIT I

Genetics- History, Genetics in Society and Biology, Fundamental Concepts of Genetics
Mendelian genetics: Monohybrid cross, Dihybrid cross, Test Cross, Back cross, Sex
determination and Sex-Linked Chromosomes, genetic vs environmental effect-multiple
alleles. Deviations from Mendelian Genetic Principles.

UNIT II

Prokaryotic and Eukaryotic Chromosomes – organization and structure-Transposable
elements, Cellular Reproduction in Prokaryotic and Eukaryotic cells - ~~mitosis and meiosis~~
significance- cell cycle-Linkage, mechanism of crossing over-genetic variability,

UNIT III

Gene concept: modern concept of gene- DNA as a genetic material- Watson and Crick model
of DNA- DNA replication- repair- Telomeres-Linkage-Recombination-Gene Mapping- DNA
Senescence.

UNIT IV

Prokaryotic and Eukaryotic Transcription and Translation-RNA and its types-Genetic code.
Control of Gene Expression:– Operon concept- Lac and Trp operon

UNIT V

Gene Mutation and Chromosome variations-Genetic disorders- in borne errors of metabolism, Banding techniques, chromosomal aberrations.

Cell Junctions and the Extracellular Matrix-Cell–Cell junctions-the Extracellular Matrix
Cancer and oncogenes.

REFERENCES

- Genetics-A Conceptual Approach by Benjamin A. Pierce, 4th Edn, 2012 W. H. Freeman and Company.
- Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, 6th Edn, 2015, Garland Science
- Genetics: A Molecular Approach by Peter J. Russell. 3rd Edn, 2010, Pearson Education, Inc.,
- Genetics by Verma and Agarwal. Chand publications.
- Genetics by Gardner, Simmons and Snustad. 2004. John Wiley & sons.

Course Code	Course Title	L	T	P	C
20116AEC24	Microbiology 3740	6	1	0	4

Aim:

- Students will understand the cellular components underlying microbial cell division.

Objectives:

- To impart knowledge on classification of microbes, function and biochemical reaction going on inside the microbial cell.

Outcomes:

- Students will gain rigorous foundation in various methods to cultivate the microbes and maintenance of the microorganism.

Unit I

Overview of history of Microbiology - Biogenesis and abiogenesis Contributions of Redi, Spallanzani, Needham, Pasteur, Tyndal, Joseph Lister, Koch [Germ Theory], Edward Jenner and Flemming [Penicillin], Scope of Microbiology. Classification of Microbes - Nutritional types [Definition and examples]. Classification on the basis of oxygen requirement.

Unit II

Ultrastructure and characteristics of bacteria, fungi, algae, and protozoans. Microbes in Extreme Environment – thermophilic, methanogenic and halophilic. Archaea - live in extreme conditions like cold, and space. Beneficial aspects of microorganisms.

Unit III

Pathogenic Microorganisms – List of common bacterial, fungal and viral diseases of human beings [Name of the disease, causative pathogen, parts affected]. Concept of Sterilization - Definition of sterilization, dry and moist heat, pasteurization, tyndalization; radiation, ultrasonication, filtration. Physical and Chemical methods of sterilization; disinfection sanitization, antiseptics sterilants and fumigation.

Unit IV

Stains and staining techniques – Definition of auxochrome, chromophores, dyes, Classification of stains, Theories of staining, Mechanism of gram staining, acid fast staining, negative staining, capsule staining, flagella staining, endospore staining. Fungal staining.

Unit V

Basic concepts of Virology - General characteristics of viruses, differences between bacteria and viruses. Classification of viruses. Ultrastructure of TMV and Bacteriophage. **SKILL**

DEVELOPMENT

REFERENCE:

- Microbiology M.J.Pelczar E.C.S.Chan and N.R.Crick. 2007.Mc Graw Hill

Course Code	Course 3742	L	T	P	C
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20117AEC25L	Cell biology and genetics Lab	0	0	3	2
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Aim:

- To enable students to learn the basics of prokaryotic and eukaryotic cells

Objectives:

- To develop practical biological skills such as staining, sterilization, dialysis etc
- To prepare students for subsequent biological courses that require an understanding of the physiology of organisms such as cell division, enzyme activity etc.

Outcomes:

- It will provide an understanding of the unique features of plant cells and animal cell.
- Gain understanding on the interaction between cells and the environment

EX:

- Mitosis in onion root
- Meiosis in flower bud
- Normal human karyotyping
- preparation of polytene chromosome
- Isolation of chloroplast from spinach leaves
- Isolation of protoplast
- Life cycle of Drosophila
- Culturing techniques and handling of flies

REFERENCE:

1. Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house

Course Code	Course Title	L	T	P	C
20116AEC26L	Microbiology lab	0	0	3	2

Aim:

- To enable students to learn the basics of microbial cells

Objectives:

- Genetic laboratory course to introduce the students to learn about prokaryotic and eukaryotic genetic system using modern techniques.

Outcomes:

- This course will provide to this students about the mechanics of experimentation methods of genetics.

EX

- Microscopic techniques.
- Sterilization methods - Moist heat (Autoclave)& Dry heat (Hot air oven).
- Preparation of media (Liquid and Solid) & (Selective and Differential media) for growth of various microorganisms.
- Culturing and Purification of various microorganisms – Pour, Spread and Streak method.
- Staining of microorganisms – Bacteria (Gram staining, Endospore, capsule, Flagella and cell wall staining), Fungi (Lactophenol Cotton Blue method)
- Growth curve, measurement of bacterial population by turbidometry
- Assay of antibiotics production and demonstration of antibiotic resistance.

SKILL DEVELOPMENT

REFERENCES:

- Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production technology. K.R.Aneja. 2001. New age international (P) Ltd Publishers.

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	2

Aim:

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effective listening
- Listening and comprehension
- Probing questions
- Barriers to listening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit III

- Techniques of effective reading
- Gathering ideas and information from a given text
 - i. Identify the main claim of the text
 - ii. Identify the purpose of the text
 - iii. Identify the context of the text
 - iv. Identify the concepts mentioned
- Evaluating these ideas and information
 - i. Identify the arguments employed in the text
 - ii. Identify the theories employed or assumed in the text
- Interpret the text
 - i. To understand what a text says
 - ii. To understand what a text does
 - iii. To understand what a text means

Unit IV

- Clearly state the claims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification

of issues

- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured
 - i. Well-knit logical sequence
 - ii. Narrative sequence
 - iii. Category groupings
- Different modes of Writing -
 - i. E-mails
 - ii. Proposal writing for Higher Studies
 - iii. Recording the proceedings of meetings
 - iv. Any other mode of writing relevant for learners

Unit V

- Role of Digital literacy in professional life
 - Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools
 - i. Paint
 - ii. Office
 - iii. Excel
 - iv. PowerPoint

Unit VI

- Introduction to social media websites
- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Digital Marketing

Unit VII

- Meaning of non-verbal communication
 - Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language
- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

Reference:

1. Sen Madhuchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

SEMESTER – III

Course Code	Course Title	L	T	P	C
20110AEC31	Tamil-III	4	0	0	2

பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம்- வல்லம், தஞ்சாவூர்

பாட குறியாடு :

தமிழ் மூன்றாம் பருவம்

இரண்டாம் ஆண்டு

செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு

செய்யுள்

செய்யுள்

அலகு : 1

1. சிலப்பதிகாரம் - மனையறம்படுத்த காளை

2. மணிமேகலை - ஆதினா பிச்சையிட்ட காளை

3. சீவக சிந்தாமணி - விம்மலையா துலம்பகம்

அலகு 2

4. பெரியபுராணம் - துளையான குடிமாற நாயனார புராணம்

5. கம்பராமாயணம் - சுகேதவி குழலினைப்படலம்

அலகு 3

6. சீறாப்புராணம் - நபி அவதாரப் படலம் : 24 வரிகள்

7. சீதம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு 4

8. நளவேண்பா - சயம்வர காண்டம் (20 - 31)

அலகு : 5: இலக்கிய வரலாறு

9. காப்பியங்கள், பழஞ்சிறு காப்பியங்கள், புராணங்கள், இலக்கியங்கள்

Employability

Course Code	Course Title	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation. •
To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech
Classification of speech sounds
Vowels and Diphthongs

UNIT –II

Consonants
Consonant cluster

UNIT – III

Syllable
Word accent
Intonation

UNIT – IV

Idiom
Interpretation of graphics

UNIT – V

Slogan writing
Writing advertisement

References:

English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma A text book of
Phonetics for Indian Students -T.B. Balasubramaniyan

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – 1

The Doctor's World -R.K. Narayan

The Postmaster -Rabindranath Tagore

Princess September -E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay The Open

Window -Saki

The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke

Uneasy Home Coming - Will F. Jenkins

Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer The Case of the

Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton

The Princess and the Wood Cutter -Alan Alexander Milne

References:-

Nine Short Stories -Steuart H.King Blackie Books One-Act plays of

Today -T.Prabhakar Emerald Publishers

Course Code	Course Title	L	T	P	C
20117AEC33	Plant physiology	4	1	0	4

Aim:

- Understand the interaction between the environment and plant growth and development

Objective:

- understand the relationship between structure and function as it relates to plant macromolecules, cells, and tissues
- Gain an appreciation of the metabolic and physiological processes unique to plants

Outcome:

- Provide examples of the variety of plants on Earth, their distinctive features, and how they fit into their unique ecosystems.

UNIT – I

Properties of water, Water potential, Osmotic potential and stomatal physiology. Uptake, transport and translocation of water, ions through cells, xylem and phloem. Transpiration and anti-transpirants. Solute transport, Ascent of sap.

UNIT-II

Mineral nutrition – deficiency symptoms, mineral salt absorption mechanism, Ion exchange theory and cytochrome-pump hypothesis, factors affecting salt absorption

UNIT-III

Principles of light absorption, energy transfer and electron transfer; CO₂ fixation - C3, C4 and CAM pathway, Mechanism of Photosynthesis. Respiration: Glycolysis, TCA cycle Electron transport system and Photorespiration. Bioluminescence.

UNIT-IV

Application of Auxins, Gibberellins, Ethylene and Abscisic acid in agriculture. Biological Nitrogen fixation, Nitrogen cycle, nif gene. Structure and function of Phytochrome, Photoperiodism and Biological clocks.

UNIT-V

Stress physiology-definition and types, Physiological responses to biotic and abiotic stresses, Mechanism of resistance to biotic stress and tolerance to abiotic stress.

REFERENCES:

- Salisbury, Frank B. & Ross, Cleon W. (1992). Plant physiology, 4th, Belmont, California: Wadsworth Publishing.
- Panday SN and Sinha B K. 1989. Plant physiology. Vikas Publishing House Pvt. Ltd, New Delhi
- devlin, R. M. and Baker 1973. Photosynthesis, Reinhold Affiliated East-West Press Pvt.Ltd, New Delhi.
- Hewitt, E.J. and cutting, C.V. 1979. Nitrogen metabolism of plants, Academic Press, London.

Course Code	Course Title	L	T	P	C
20117AEC34	Immunology	4	1	0	5

Aim:

- To learn the immune system and reaction

Objectives:

- To expose the students with the immune system of human body

Outcomes:

- The students may understanding the immune system, its components and various Techniques used in bio manipulation.

Unit I

Introduction, Lymphocytes, their origin and differentiation, antigens, their structure and classification, complement and their biological functions, types of immune responses, anatomy of immune response.

Unit II

B-Lymphocytes and their activation, structure and function of immunoglobulin, immunoglobulin classes and subclasses, genetic control of antibody production, mono-clonal antibodies and diagnosis, idiotypic and antibodies, major histocompatibility complex.

Unit III

Thymus derived Lymphocytes (T Cells) their classification antigen presenting cells (APC), macrophages, langerhans cells, their origin and function, mechanisms of phagocytosis, identification of cell types of immune system, immunosuppression.

Unit IV

Hypersensitivity reactions, mechanisms of T cell activation, cytokines and their role in immune response macrophage activation and granuloma formation.

Unit V

Graft rejection, evidence and mechanisms of graft rejection, prevention of graft rejection, immunosuppressive drugs, HLA and disease, mechanisms of immunity to tumor antigens.

REFERENCES:

- Immunology by I.J. Kubey .1991 Freseman and company.
- Essential immunology Ivan Roitt , 1994. Blackwell Scientific publisher, Oxford.

Course Code	Course Title	L	T	P	C
20117AEC35L	Plant physiology Lab	0	0	3	2

Aim:

- Student identify and assess viability of cells by microscopic examination.

Objectives:

- Identify the problems associated with growing, storing and identifying a wide range of different cell types.
- Analyze data using appropriate techniques.

Outcomes:

- Produce a report of their work, which employs a range of skills of written expression and uses appropriate vocabulary consisting of a practical report.

EX:

- To demonstrate the ascent of sap takes place by xylem (Ringing experiment)
- To demonstrate the phenomenon of Transpiration
- To find out Transpiration and Absorption ratio (T/A)
- To measure the rate of transpiration by using Ganong's potometer
- To demonstrate the oxygen is liberated in the process of photosynthesis
- To demonstrate the CO₂ and light is essential for photosynthesis (Molls half leaf experiment)

REFERENCES:

- L. Taiz and E. Zeiger. 2007. *Plant Physiology*. 4th ed. Sinauer Associates, Inc
- Hopkins and N. P. A. Huner. 2009. *Introduction to Plant Physiology*. 4th ed. John Wiley & Sons, Inc.
- B. B. Buchanan, W. Gruissem, and R. L. Jones. 2000. *Biochemistry and Molecular Biology of Plants*. John Wiley & Sons, Inc

Course Code	Course Title	L	T	P	C
20117AEC36L	Immunology Lab	0	0	3	2

Aim:

- To enable students to learn the basics of immunological techniques

Objectives:

- To impart knowledge on the immune system and characterization of immune aspects

Outcomes:

- Students will get an knowledge on enzyme characteristic analysis

EX:

- Antigen preparation
- Blood grouping
- Rh factor typing
- Blood collection- serum and plasma preparation
- Antigen and antibody reaction
- Determination of blood cell count- RBC, WBC and platelets

EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT

REFERENCES:

1. Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.
2. Biochemical methods II Edition Sadasivam, A. and Manickam, A. New age International P ltd. Publishers.

Course Code	Course Title	L	T	P	C
20117RMC37	Research Methodology	2	0	0	2

AIM:

To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computational frameworks used in mathematical researches.

PREREQUISITES:

Basic computer literacy & skills for working in window-environment

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V:

Basic Principles of Laboratory Safety and Waste management

Introduction - Access to Laboratory and Emergency Exits - Personal Protective Clothing and Equipment - Good Working Practices-Maintenance of Laboratory Equipment - Working with Hazardous Substances - Storage of Chemicals - Working with Flammable Solvents - Gas Cylinders-Fire Precautions - Emergency Procedures - First Aid - Accident Follow-Up - Safety Manual - Safety Training - Management of Laboratory Safety and Responsibilities - Waste Management.

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Aim:

Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd. 3.
- Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. <https://en.wikipedia.org>
6. <https://wiki.openoffice.org/wiki/Documentation>
7. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>

SEMESTER – IV

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தமிழ்.

செய்யுள், சங்க இலக்கியம், அறு இலக்கியம், செம்மொழி, இலக்கிய வரலாறு

அலகு .1: பண்டைய இலக்கியம்- நற்றிணை.

- 1 நெய்தல்-தோழி கூற்று-பாடல் எண் . 11
- 2 குறிஞ்சி- தலைவி கூற்று- பாடல் எண். 64
- 3 முல்லை- தலைவன் கூற்று- பாடல் எண். 142
- 4 பாலை- நற்றாய் கூற்று-பாடல் எண் . 23
- 5 மறதம்- தலைவி கூற்று- பாடல் எண். 70

பண்டைய இலக்கியம் கறுத்தொகை

- 1 குறிஞ்சி- தோழி கூற்று-பாடல் எண்.1
- 2 முல்லை- செவிலித்தாய் கூற்று- பாடல் எண்.18
- 3 மறதம்- தலைவி கூற்று-பாடல் எண் . 131
- 4 நெய்தல்- தலைவி கூற்று-பாடல் எண் . 136
- 5 பாலை- தலைவன் கூற்று-பாடல் எண் . 147

பண்டைய இலக்கியம் கங்கறுத்துறு

- 1 மறதம்- கள்வன் பத்தி- முதல் இரண்டு பாடல்கள்
- 2 நெய்தல்- தோழிக்குரைத்த பத்தி- முதல் இரண்டு பாடல்கள்
- 3 குறிஞ்சி- ஓளறல் குறவன் பத்தி- முதல் இரண்டு பாடல்கள்
- 4 பாலை- இளவேனிறு பத்தி- முதல் இரண்டு பாடல்கள்
- 5 முல்லை- பாசறைப் பத்தி- முதல் இரண்டு பாடல்கள்

அலகு .2: கனித்தொகை

- 1 பாலை-பாடல் எண் . 1
- 2 குறிஞ்சி- பாடல் எண். 37

அகநானூறு

- 1 பாலை-பாடல் எண் . 1
- 2 மறதம்- பாடல் எண். 6

புறநானூறு

பாடல் எண் . 8, 121, 41, 152, 172, 191, 221, 245, 254, 358

பதிற்றுப்பத்து

இரண்டாம் பத்தி பாடல் எண் 4 (நிலம் நீர் வளி விசம்பு)

அலகு.3:

1. படமன்பாலை- முதல் 105 வரிகள்
- 2 திருக்குறள் - 1. மறத்தல் 2. ஊக்க முளடமம் 3. உழவு

அலகு . 4: செம்மொழி வரலாறு;

மொழி- விளக்கம், மொழிக்கருடும்பங்கள், உலகச் செம்மொழிகள், இந்நியச் செம்மொழிகள், செம்மொழித் தகுதிகள், வளரையாளர்கள், வாசம் தமிழ்ச் செம்மொழி தொன்மை, தமிழின் சிறப்புகள், தமிழ் செம்மொழி நூல்கள்

அலகு .5: இலக்கிய வரலாறு

சங்க இலக்கியங்கள், பதினெண் கீழ்க்கணக்கு நூல்கள்.

Explanatory

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation

– Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

Technical Communication -Meenakshi Sharma & Sangeetha Sharma English for writers and translators -Robin Macpherson

English Work Book-I&II -Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Read and comprehend literature

UNIT –I

How to be a Doctor -Stephen Leacock
 My Visions for India -A.P.J. Abdul Kalam
 Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning
 The Toys -Coventry Patmore
 I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin
 The Verger -W.S Maugham
 A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth
 As You Like It

UNIT –V

Henry IV
 Tempest

References:-

English for Enrichment -.Devaraj Emerald Publishers Selected Scenes from Shakespeare Book I &II -Emerald Publishers

Course Code	Course Title	L	T	P	C
20117AEC43	Animal physiology	4	1	0	4

Aim:

- To be able to read, interpret and discuss scientific journal articles in physiology.

Objectives:

- To provide advanced undergraduate and introductory graduate students with a comprehensive overview of animal physiology from molecular, cellular and whole animal systems approaches.
- To critically evaluate clinical and research case problems relating to endocrinology and cell biology.

Outcomes:

- Understand the physiological processes that regulate body functions and the regulation of an organ system from the molecular all the way to the whole animal level
- Understand how changes in one system may impact a different system

UNIT I

Respiration: Availability of oxygen- respiratory organs in animals- properties and functions of respiratory pigments- regulation of respiration

UNIT II

Circulation: types of hearts- composition and functions of blood- cardiac rhythm- cardiac output- ECG- blood pressure- electrical activity and properties of heart- regulation of cardiovascular function.

UNIT III

Coordination (neuromuscular and neuroendocrine): Nerveimpulse conduction- ultrastructure of muscle – theories of muscle contraction

UNIT IV

Excretion: structure and functions of different excretory organs in animals- mechanism of urine formation in man

UNIT V

Homeostasis: Significance- mechanism of osmo-ion regulation in fresh water, estuarine and marine fishes.

REFERENCES:

- Human Physiology, Stuart Fox, 11th ed., McGraw Hill
- Linda Costanzo's "Physiology- Board Review Series (5th ed.)" Lippincott Williams & Wilkins.

Course Code	Course Title	L	T	P	C
20117AEC44	Molecular biology	5	1	0	5

Aim:

- Understand the basic concepts and applications of molecular mechanisms in a cell.

Objectives:

- To outline the basics of A central goal is understanding gene regulation at all levels, and the structure-function relationships of nucleic acids and proteins.

Outcomes:

- To Understand the regulation of protein and nucleic acids function
- To know the structure-function relationships and macromolecular interactions. • To find out newer methods to implement rDNA Technology for various organisms.
- To understand several modern molecular methods to elucidate molecular and genetic questions.

UNIT I:

Organization of chromosomes, specialized chromosomes, chromosome abnormalities Numerical and Structural chromosome mutations, crossing over.

DNA and RNA as genetic material, Concept of Gene, Gene-cistron relationship in prokaryotes and eukaryotes.

UNIT II:

Principles of Transcriptional Regulation, Regulation of Chromatin Structure, regulatory RNAs, silencing gene expression by small RNAs, Viral infection strategy and gene expression

DNA damage and repair – excision repair, recombinational repair, promotor, operator, terminator and attenuator, Oncogenes and Tumor-suppressor genes

UNIT III:

Gene expression in prokaryotes and eukaryotes, Natural Gene Transfer in Bacteria Types, Homologous recombination, Genomes and Mapping, gene linkage, three-point cross, tetrad analysis, Mobile Genetic Elements-Transposons, Retroelements and their consequences.

UNIT IV:

Plasmids-classification, replication and maintenance, artificial plasmids' Gene cloning: principles and strategies, Cloning vectors for higher plants and animals- Cloning DNA Sequences That Encode Eukaryotic Proteins.

Natural and artificial plasmid transfer and their applications. Insertion sequence in prokaryotes.

UNIT V:

Model organisms used as tool in rDNA Technology-*Escherichia coli*, *Saccharomyces cerevisiae*, *Saccharomyces cerevisiae*, *Caenorhabditis elegans* and *Arabidopsis thaliana*, zebrafish. Principles of PCR- Types and their applications. Construction of genomic

. REFERENCES:

1. Advanced Molecular Biology: A Concise Reference (2000) R M Twyman, Garland/BIOS Scientific Publishers.
2. Molecular Biology (2000), Craig, Orna , Rachel Green, Carol W Greider, Carol W Greider. Oxford University Press
3. S.R. Maloy, J. Egronan and D. Friefelder (1994), Microbial genetics by Jones and Bartlett Publishers.
4. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 7th edition, CSHL Press, Pearson Publication.
5. Molecular Biology-Principles and Practice, Michael M. Cox, University of Wisconsin–Madison, Jennifer A. Doudna, Michael O’Donnell
6. Gene Cloning & DNA Analysis-An Introduction by T.A. Brown, 7th Edition, 2016. John Wiley & Sons, Ltd.

Course Code	Course Title	L	T	P	C
201ENSTU45	Environmental Studies	2	0	0	2

Aim:

- To motivate for participation in environment protection and improvement.

Objectives:

- Creating the awareness about environmental problems among people. •
- Imparting basic knowledge about the environment and its allied problems. •
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Outcomes:

- Students will gain about environmental pollutions, preventive measures. • Student will gain information related to societal issues in concern with environment. • Students should have out line knowledge on natural resources and effective management of resources.

1. Nature of Environmental Studies

- Definition, scope and importance.
- Multidisciplinary nature of environmental studies
- Need for public awareness.

2. Natural Resources and Associated Problems.

- Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.
- Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
- Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.
- Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
- Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of an individuals in conservation of natural resources.

3. Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.

Ecological succession.

Food chains, food webs and ecological pyramids.

Introduction, types, characteristics features, structure and function of the following ecosystem:

a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.

Bio — geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

India as a mega — diversity nation.

Western Ghat as a biodiversity region.

Hot — spot of biodiversity.

Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

5. Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

6. Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issue and possible solutions.

Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.

Environmental Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural / Industrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems — ponds, river, hill slopes, etc.

References:

- 1) Agarwal, K.C,2001, Environmental Biology, Nidi Pub. Ltd., Bikaner. 2) Bharucha

Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)

- 3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- 4) Clank R.S., Marine Pollution, Clarendon Press Oxford (TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) De A.K., Environmental Chemistry, Wiley Western Ltd.
- 7) Down to Earth, Centre for Science and Environment, New Delhi. (R)
- 8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dev. Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)
- 10) Heywood, V.K. & Watson, R.T.1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, V.J.V. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
- 12) Mickinney, M.L. and School. R.M. 1196, Environmental Science Systems and Solutions, Web enhanced edition, 639p.
- 13) Miller T.G. Jr. Environmental Science. Wadsworth Publications Co. (TB).
- 14) Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574zp.
- 15) Rao M.N. and Dana, A.K. 1987, Waste Water Treatment, Wxford & IBH Publ. Co. Pvt. Ltd., 345p
- 16) Sharma B.K., 2001, Environmental Chemistry, Gokel Publ. Hkouse, Meerut
- 17) Survey of the Environment, the Hindu (M)
- 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)
- 20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
- 21)Wagner K.D., 1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
- 22) Paryavaran shastra — Gholap T.N,
- 23) Paryavaran Sahastra — Gharapure
(M) Magazine
(R) Reference
(TB) Textbook

Learning Outcomes:

- Students who graduate with a major in environmental science will be able to:
1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
 2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
 3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
 4. Apply their ecological knowledge to illustrate and graph a problem and
 5. describe the realities that managers face when dealing with complex issues; and
 6. Understand how politics and management have ecological consequences.

Course Code	Course Title	L	T	P	C
20117AEC46L	Animal physiology Lab	0	0	3	2

Aim:

- To develop further practical biological skills introduced in 1A Physiology of Organisms

Objective:

- To provide a course of study in mammalian, principally human, systems physiology, building on knowledge of basic physiological principles established in the Part IA Physiology of Organisms course

Outcome:

- Have an enhanced knowledge and appreciation of mammalian physiology
- Understand the functions of important physiological systems including the cardio respiratory, renal, reproductive and metabolic systems

EX:

- Estimation of oxygen consumption in an aquatic animal (fish)
- Blood smear: total and differential count (prepared slides)
- Qualitative analysis of excretory products in animals
- Enzyme activity in relation to pH
- Measurement of blood pressure
- Physiological response to exercise

EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT

REFERENCES

- Hill, R. W., G. A. Wyse, and M. Anderson. 2008. *Animal Physiology*, 2ND Edition. Sinauer Associates. Sunderland, MA.
- Cooper, S. J., and Vaughan, D.K. 2010. *Biology 319/519: General Animal Physiology Lab Manual*. UW-Oshkosh.

Course Code	Course Title	L	T	P	C
20117AEC47L	Molecular Biology Lab	0	0	3	2

Aim:

- Understand the basic structure and applications of molecular mechanisms in a cell.

Objectives:

- To understanding gene regulation at all levels, and the structure-function relationships of nucleic acids and proteins.

Outcomes:

- To know the isolation methods of protein and nucleic acids
- To know the structure-function of nucleic acid and protein.
 - To find out newer methods to implement rDNA Technology for various organisms.
- To understand several modern molecular methods to elucidate molecular and genetic questions.

Experiments

1. Isolation of Genomic DNA
2. Isolation of Protein
3. Salting out- Dialysis method.
4. Protein precipitation method
5. Agarose Gel Electrophoresis
6. Amplification of DNA using PCR
7. Isolation of RNA.

REFERENCES:

1. Molecular Biology and Genomics(2007)-The Experimenter Series, Cornel Mulhardt ,Academic Press, Elsevier
2. Molecular Cloning-A LABORATORY MANUAL (2012), 4th Edition, Michael R. Green and Joseph Sambrook, CSHL Press
3. Principles and Techniques of. Biochemistry and. Molecular Biology (2018). 7th Edn. Keith Wilson and John Walker, Cambridge University Press

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

AIM:

The aim of the course cultivating and nurturing the innate leadership skills of the youths so that they may transform these challenges into opportunities and become torchbearers of the future by developing creative solutions.

Course Objective:

The Module is designed to:

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management, Handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Teamwork
- Negotiation
- Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self-Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
 - Classification and types of entrepreneurship
 - Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitchmaking

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
 - Discovery
 - Interpretation
 - Ideation
 - Experimentation
 - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V - Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration • Drawing insights for leadership
 - How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decisionmaking
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings:

Books

- Ashokan, M. S. (2015). *Karmayogi: A Biography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design*. HarperBusiness
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us All*. William Collins
- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M.H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good*. HarperCollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019-02-15 from <https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63>.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam. "A Leader Should Know How to Manage Failure" <https://www.youtube.com/watch?v=laGZaS4sdeU>
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, 85(6):60.
 - NPTEL Course on Leadership - <https://nptel.ac.in/courses/122105021/9>

SEMESTER – V

Course Code	Course Title	L	T	P	C
20117AEC51	Food and Agricultural Biotechnology	4	1	0	4

Aim:

- To study the production mechanisms and various properties of Food and agricultural biotechnology

Objectives:

- The students will be able to apply principles of biotechnology in food and agriculture through biotechnology.
- To introduce basic processes in food technology and regulatory bodies and various factors in food shelf life evaluation

Outcomes:

- To study about molecular biology and enzymes and fermentation in food.
- To understand the food production and preservation techniques
- To acquire knowledge on agricultural techniques
- To know the knowledge about genetically modified food
- To understand food safety and standards

Unit I -Introduction to Food Biotechnology

History and evolution of food processing technology. Genetically Modified Foods Plant and Animal origin. Ethical issues concerning GM Foods, testing for genetically modified organisms.

Unit II –Food Quality, Preservation and Processing

Basic principles and application of processing techniques-Food Additives. Principles of Food Preservation - processing of foods criteria for assessing freshness handling of fresh materials – on board handling and chilling methods.

Unit III –Drying, Freezing, Packing and Management

Drying and dehydration – conventional and modern methods. Freezing and cold storage – process of freezing and its types. Packing – Principles, food packaging requirements, packaging materials, types. Food hazards of physical and chemical origin and biological origin and its management.

Unit IV - Introduction and Importance of Agricultural biotechnology Agricultural biotechnology - Introduction, Organic farming, green manure production, Soil fertility and management, vermicomposting. Fundamentals of Crop Production: evolution of crops – civilization of human, Crop improvement hybridization and plant breeding techniques, Technology for Crop Production.

Unit V – Future prospects of Agriculture Biotechnology

Introduction to GM Crops, Implications of GM-Crops in Agriculture, Ethical Aspects and Public Acceptance, Crop seasons and crop rotation, Sustainable agriculture; pheromones, traps etc., - Benefits and controversies

References

1. Byong H. Lee, 2015. Fundamentals of Food Biotechnology, Second Edition, JohnWiley & Sons, Ltd
2. Chandran, K.K., 2000 Post Harvest Technology of Fish and Fishery Products, Daya Publishing House, New Delhi.
3. Oliveira, F.A.R. and J.C Oliveira, 1999. Processing Foods: Quality Optimization and Process Assessment, CRC Press.
4. Food Biotechnology- Marwa, Arora
5. Hemant Rawat, 2008, Agricultural Biotechnology, Oxford Book Company
6. Arie Altman, 2006, Agricultural Biotechnology, Taylor & Francis

Course Code	Course Title	L	T	P	C
20117AEC52	Cell and Tissue Culture	4	1	0	3

Aim:

- To develop and standardize protocols for the in vitro propagation from ex vitro explants

Objectives:

- To optimize the culture conditions for rapid propagation to increase the biomass production
- Optimization of medium and culture conditions for the enhancement of active principle production by different approaches

Outcomes:

- The students should be able to know how to use different sources of tissues

UNIT I

History of plant cell, tissue and organ culture- laboratory organization- aseptic techniques
nutritional requirement

UNIT II

Culture media- types of culture- solid- liquid- stationary- agitated- batch culture.
Organogenesis- callus induction-rhizogenesis- induction of multiple shoots

UNIT III

Micro propagation- mass production of plantlets- hardening and mist chamber
transplantation to field- techniques for maintaining plantlets in the field- somatic
embryogenesis-protoplast isolation and culture.

UNIT IV

Principle of animal cell and tissue culture- advantages and disadvantages of culture methods
types of cells- primary and established cell lines- kinetics of cell growth-applications of
animal tissue culture

UNIT V

Techniques of animal cell and tissue culture: Sources of cells- techniques of cell culture- cell
culture media- culture procedure- preparation of animal materials- slide and coverslip culture-
double cover slip culture- flask culture- test tube culture-measurement of cell death.

REFERENCES:

- Plant tissue culture by Kalyan Kumar
- Animal Biotechnology by Ranga

Course Code	Course Title	L	T	P	C
20117AEC53	Industrial Biotechnology	4	1	0	4

Aim:

- Understanding the industrial importance of microorganisms and their products.

Objectives

- To study the development of industrial biotechnology and microbes of industrial prominence.
- To acquire knowledge on design of fermenters and its types.
- Industrial production of various pharmaceutical and commercial products using microbes.

Outcomes

CO1- To understand the vital role of various substrate used in fermentation.

CO2- To Learn the different types of reactors or fermenters.

CO3- To gain knowledge about upstream and downstream processing

Co4 - To acquire the knowledge on different product production

UNIT – I

Historical development of Industrial Microbiology, Industrially important microorganisms, Primary and secondary screening and preservation of industrially important strains. Microbial strains improvement. Primary and secondary metabolites.

UNIT – II

Fermenter: Design, types and basic functions of fermenter. Fermentation media formulation strategies, Essential factors (pH and temperature, incubation), carbon, nitrogen, vitamin and mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams, types of fermentation.

UNIT – III

Downstream processing: Product recovery and purification (intracellular and extracellular), cell disruption, precipitation, filtration, centrifugation, solvent recovery, chromatography, ultrafiltration, drying, Enzyme and cells immobilizations and its applications.

UNIT – IV

Microbial products of pharmaceutical value – raw materials, organism and Industrial processes involved in the production of Penicillin, Streptomycin, Vitamin B12, Riboflavin and rabies vaccine.

UNIT – V

Microbial products of Industrial value – Raw materials, organism and Industrial processes involved in the production of ethanol, vinegar, amylase, protease, glutamic acid. Recycling and safe disposal of Industrial wastes through microbes.

Reference:

1. Stanbury, P.F. Whitaker, A.Hall, S.J. 1995. Principles of Fermentation Technology, Pergamon Press.
2. Sikyta, B.1983. Methods in Industrial Microbiology, Ellis horwood limited.
3. Click, B.R.Pasternak, J.J.1994. Molecular Biotechnology – ASM Press.

4. Demain A.L.Solomon, N.A.1986. Mannuall of Industrial Microbiology and

Biotechnology. ASM Press

5. Reed. G. 1982. Prescott and Dunn's Industrial Microbiology. Macmillian Publishers. 6.
6. Prave, P.Faust, V, Sitting, W., Sukatsch, DA. 1987. Fundamentals of Biotechnology. ASM Press.
7. Malik V.S.Sridhar, P.1992. Industrial Biotechnology. Oxford & IBH.

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
20117DSC54A	rDNA Technology	4	1	0	3

Aim:

- To improve the analytical and desirable manipulation skill for recombinant DNA technology

Objectives:

- The main objective of the paper is to expose students in using the current tools for rDNA technology and their applications.

Outcomes:

- This paper provides the student a thorough knowledge in principles and methods in genetic engineering and their applications.

UNIT I

Gene cloning: principles and strategies - vectors- general characters- types-replication plasmids- phage vectors- cosmids- plant and animal vectors- Restriction Endonucleases and Ligases.

UNIT II

Gene Transfer Methods- transformation- artificial methods of gene transfer- Physical, chemical and biological methods-electroporation, biolistics, microinjection- liposome mediated gene transfer.

UNIT III

Genetic Transformation of Prokaryotes-Introduction of DNA into Living Cells-Identification of recombinants-Introduction of phage DNA into bacterial cells
Cloning vectors for higher plants and animals- Cloning DNA Sequences That Encode Eukaryotic Proteins.

UNIT IV

Construction of genomic DNA libraries and c-DNA library- probes- types and construction
Screening a Library-labelling of probes- applications of probe. Cloning in *E.coli* and yeast.
Concept of PCR- applications- PCR variants- analysis of amplified product- cDNAs, Gene Synthesis by PCR

UNIT V

Applications of rDNA technology in medicine, agriculture and industry. Safety aspects of rDNA technology. Production of Protein from Cloned Genes, Production of recombinant protein by eukaryotic cells- animal and plant cells

EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT

REFERENCES:

1. Principles of Gene Manipulation by Old and primrose, 7th Edition 2006, Blackwell Scientific Publications.
2. Molecular Biotechnology: Principles and Applications of Recombinant DNA. By Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten. 4th Edn. 2010. ASM Press, 3. Gene Cloning & DNA Analysis-An Introduction by T.A. Brown, 7th Edition, 2010. John Wiley & Sons, Ltd.

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
20117DSC54B	Bioinformatics and Biostatistics	4	1	0	3

Aim:

- know the theory behind fundamental bioinformatics analysis methods. •
- Be familiar with widely used bioinformatics databases.

Objective:

- The course is aimed at introducing the students to the field of Bioinformatics and enable them understand the concepts of statistics in biology.

Outcome:

- Know the applications and limitations of different bioinformatics and statistical methods.
- Be able to perform and interpret bioinformatics and statistical analyses with real molecular biology data.
- Be able to describe statistical methods and probability distributions relevant for molecular biology data.

UNIT I

Introduction to bioinformatics- scope and applications- characteristics of hardware and software- types of computer- computer network- sending and receiving email- searching biological articles in net.

UNIT II

Uses of databases in biology- sequence databases- structural databases- tools for analysis BLAST, FASTA, CLUSTAL W. Database organizations- NCBI, EMBL, DDBJ

UNIT III

Sequence analysis of proteins/ nucleic acids- structural comparisons- molecular

modeling Applications of statistics in biology- measures of central tendency- mean,

median and mode- measures of dispersion- standard deviation and standard error.

UNIT V

REFERENCES:

- Introduction to Biostatistics by Sokal and Rohif , 1973, Toppan Co. Japan.
- Molecular databases for protein sequence and structure studies by J.A. Sillince and M. Sillince, 1991, Springer International.

Course Code	Course Title	L	T	P	C
20117AEC55L	Food and Agricultural Biotechnology, Tissue Culture Lab	0	0	3	2

Aim:

- To study evaluation of microbiological quality and various properties of Food and agricultural biotechnology
- Identify and describe the structural features of plants.
- Explain the mechanisms which lead to cell determination.

Objectives:

- To introduce basic processes in food technology and regulatory bodies and various factors in food shelf life evaluation
- Discuss the basic processes of plant metabolism, transport, nutrition, growth, and reproduction.

Outcomes:

- To understand the principles of biotechnology in food and agriculture through biotechnology.
- To know the food and agriculture analytical techniques
- To gain knowledge on design experiments to test the hypothesis.

Experiments

1. Effect of cleaning and disinfection on microbial load
2. Analysis of water for potable and food purposes
3. Detection/Estimation of adulterants in some foods.
4. Acid hydrolysis and action of salivary amylase on starch
5. Evaluation of microbiological quality of milk
6. Demonstration of microbial production of curd
7. Microbial Examination of vegetable sample-surface washing and internal tissue
8. Preparation of Tissue culture Media
9. Demonstration of surface sterilisation of explant
10. Isolation of protoplast
11. Induction of Callus
12. Primary cell culture and maintenance of cell lines

References

1. Microbiology: A Laboratory Manual, 10th Edn. James Cappuccino, Natalie Sherman. Pearson Higher education
2. Morris B. Jacobs, The chemical analysis of foods and food products, III Edition, CBS Publishers and distributors New Delhi.
3. Practical Microbiology, R C Dubey, D K Maheshwary
4. James Cappuccino, Microbiology: A Laboratory Manual, 10th edition., Natalie Sherman. Pearson Higher education
5. Plant tissue culture manual, K. Linsey, 2007, Eastern book corporation.

Course Code	Course Title	L	T	P	C
20117AEC56L	Industrial Biotechnology Lab	0	0	3	2

Aim:

- To learn the methods of industrial product production

Objectives:

- To make students familiar with principles of enzyme activity, analysis of enzyme on the immune system and different product production

Outcomes:

- To gain knowledge on enzyme production and characteristic analysis.
- To know the industrial process of various product production
- To gain the knowledge on industrial strain isolation and purification

Experiments

1. Microbial cell growth kinetics
2. Kinetic study of amylase
3. Immobilization of cells and enzymes by calcium alginate method
4. Estimation of enzyme (amylase)
5. Enzyme production and extraction-Lipase, protease and cellulase
6. Production of citric acid
7. Isolation and screening of antibiotic producers by crowded plate technique.
8. Isolation of Actinomycetes from soil
9. Isolation of Nitrogen fixers from soil
10. Enzyme activity – Effect of pH

REFERENCES:

1. K.J.Laider and P.S.Bunting, The chemical kinetics of enzyme action: Oxford University Press,London.
2. Molecular cloning by Sambrook *et al.* volume-I
3. Peter F. Stanbury, Stephen J. Hall &A. Whitaker, Principles of Fermentation Technology, Science & Technology Books.

AUDIT COURSE				
201ACLSPSL	Professional Skills	-	-	2

Course Objectives:

The Objectives of the course are to help students/candidates:

Acquire career skills and fully pursue to partake in a successful career path

Prepare a good resume, prepare for interviews and group discussions

Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Course Outcomes:

At the end of this course the students will be able to:

- Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
- Participate in a simulated interview
- Actively participate in group discussions towards gainful employment
- Capture a self - interview simulation video regarding the job role concerned
- Enlist the common errors generally made by candidates in an interview
- Perform appropriately and effectively in group discussions
- Explore sources (online/offline) of career opportunities
- Identify career opportunities in consideration of their own potential and aspirations
- Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit I: Resume Skills: Preparation and Presentation, Introduction of resume and its importance, Difference between a CV, Resume and Biodata, Essential components of a good resume, Resume skills: common errors, Common errors people generally make in preparing their resume, prepare a good resume of her/his considering all essential components

Unit II:

Interview Skills: Preparation and Presentation, Meaning and types of interviews (F2F, telephonic, video, etc.). Dress Code, Background Research, Do's and Don'ts, Situation, Task, Approach and Response (STAR Approach) for facing an interview. Interview procedure (opening, listening skills, closure, etc.). Important questions generally asked in job interview (open and closed ended questions).

Unit III:

Interview Skills: Simulation Observation of exemplary interviews Comment critically on simulated interviews, Interview Skills: Common Errors: Discuss the common errors generally candidates make in interview Demonstrate an ideal interview

Unit IV:

Group Discussion Skills: Meaning and methods of Group Discussion, Procedure of Group Discussion, Group Discussion-Simulation, Group Discussion - Common Errors.

Unit V:

Exploring Career Opportunities: Knowing yourself - personal characteristics,

Knowledge about the world of work, requirements of jobs including self-employment.

Sources of career information, preparing for a career based on their potentials and availability of opportunities

SEMESTER VI

Course Code	Course Title	L	T	P	C
20117AEC61	Plant and animal biotechnology	4	1	0	4

Aim:

- Activities of Animal biotechnology
- Activities of plant biotechnology

Objective:

- Definitions and scope of Animal biotechnology
- Use the Big Data technology to assist basic and translational research in plants.

Outcomes:

- Basic concepts and procedures, pitfalls, and remedies of using machine learning.

UNIT – I

Plant genome organization - Nucleus, Chloroplast genome and Mitochondrial genome, cytoplasmic male sterility. Regulation of gene expression in plant development. Plant–microbes-associated insect vectors and diseases.

UNIT – II

Agrobacterium and crown gall tumour, Ti and Ri plasmids, T-DNA, binary vectors, viral vectors, 35S and other promoters, use of reporter genes and marker genes, Gene transfer methods in plants: direct and indirect DNA transfer. Manipulation of genes and regulatory sequences in plants.

UNIT - III

Genetic engineering in plants. Plant transformation techniques, Pest and disease resistant plants. Benefits of transgenic technology , Applications of plant biotechnology Biotechnology for improved crop quality and productivity. Genetically Engineered Microorganisms-Genetically Modified Crops.

UNIT – IV

Genetic engineering in animals: -transformation of animal cells- vectors for animal cells- gene therapy- DNA fingerprinting in forensic science. *In vitro* fertilization and embryo transfer- transgenic animal production. - Xenograft

UNIT –V

Applications of Biotechnology Techniques - Animal models, Upstream and Downstream Process Technology, Molecular biotechnology for diagnostics techniques in identification and

REFERENCES:

- Plant Biotechnology by Mantell, S.H and Smith, H. 1983. Cambridge University press, UK.
- Molecular biotechnology : principles and applications of recombinant DNA. By Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten. 4th ed. 2010. ASM Press,
- Genetic engineering in animals by A.Puller.
- Applied Molecular Biotechnology Edited by Muhammad Sarwar Khan, iqrar Ahmad Khan and debmalya Barh. 2016. CRC Press, Taylor & Francis Group.
- Animal Biotechnology: Science-Based Concerns 2002 By Committee on Defining Science-based Concerns Associated with Products of Animal Biotechnology. THE NATIONAL ACADEMIES PRESS.
- Animal Cell Biotechnology by Hansjörg Hauser, Roland Wagner (Eds.) 2015. Walter de Gruyter GmbH, Berlin

Course Code	Course Title	L	T	P	C
20117SEC62	Applied Biotechnology	4	1	0	5

Aim:

- To introduce students to the application of mathematical modeling in the analysis of biological systems including populations of molecules, cells and organisms.

Objectives:

- The applied biotechnology major provides students with the scientific background and laboratory experience necessary for employment in the biotechnology

Outcomes:

- have an enhanced knowledge and understanding of mathematical modeling and statistical methods in the analysis of biological systems;

UNIT-I

Sericulture: History and origin of sericulture in India; Silk worms, rearing, controlling factors, harvesting techniques; Host plant varieties, distribution, cultivation techniques. Silk reeling; Natural enemies of mulberry garden and silk worms; By-products of sericulture.

UNIT – II

Vermiculture: Compost development, Quantification and characterization of solid waste, factors responsible for composting. Earthworm- rearing of earthworm, role of earthworms in vermicompost, vermisppecies, earthworms and microorganisms- vermicompost- methods and steps, nutrition enrichment- applications of vermiculture.

UNIT –III

Mushroom cultivation: Mushroom culture. Historical background; Present status of Mushroom culture in India. Cultivation methods – infrastructure substrates; Preparation of spawns; Formulation and preparation of composts; Spawn running and cropping; Control of pathogens and pests. Cultivation of *Volvariella* sp, *Pleurotus* sp and *Agaricus bisporus*. Nutritional values, Recipes from Mushroom.

UNIT – IV

Aquaculture:Definition- extensive, intensive and semi intensive practices- preparation and management of ponds- estimation of live feed organisms- natural and artificial feeds- nutritional ecology- spawning and breeding- cultural techniques.

UNIT – V

Apiculture:Species of honey bees- life history- bee colony, castes, developmental significance of social life- natural colonies and their yield. Honey extraction- uses of honey and bee wax

REFERENCES:

- G. Ganga 2003 Comprehensive Sericulture Volume 2: Silkworm Rearing and Silk Reeling.Science Publishers, USA
- Beekeeping in India by Sardar Singh (I.C.M.A.R)

Course Code	Course Title	L	T	P	C
20117SEC64L	Plant, Animal Biotechnology lab	0	0	3	2

Aim:

- Able to understand Scope, principle, merits and demerits of animal and plant tissue culture.

Objectives:

- Laboratory facilities and culture media for animal tissue culture.
- Isolation and identification of Xanthomonas citri, Rizobium sp, Azotobactor

Outcomes:

- Economic aspects of transgenic animals and Ethical issues of animal welfare and animal rights.
- Determination of IAA Activity

EX:

- Shoot induction from callus
- Root induction from explant
- Monoclonal antibody production.
- Purification of Immunoglobulins.
- Sericulture preparation
- Spawn preparation
- Mushroom cultivation
- Preparation of vermibeds
- Collection and Identification of earthworm
- Isolation of microorganism from vermicompost

REFERENCES:

- Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom production technology. K.R.Aneja. 2001. New age international (P) Ltd publishers.
- Plant tissue culture manual, K. Linsey, 2007, Eastern book corporation.
- Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.
- Handbook of practical sericulture. Ullal and Narashma, CSIR Bulletins on Sericulture.

Discipline Specific Elective - II

Course Code	Course Title	L	T	P	C
20117DSC63A	Environmental Biotechnology	4	1	0	3

Aim:

- students are able to understand

Objectives:

- Bioremediation – Characterization site for bioremediation ,Types of bioremediation
- Biodegradation-Assimilation , Detoxification , Biotransformation , Factor Affecting

Outcomes:

- Biofuels: Advantages , Energy from biomass, Biogas, Biohydrogen, Biosafety
- Toxicity – Bio magnification, Threshold Dose, Factor Affecting Toxicity , Antidotal Procedure

UNIT:I

Environment: Basic Concepts; Environmental Pollution; Types of Pollution; Measurement of Pollution; Environmental Management. Water Pollution and Its Control: Water as a Resource; Water Bodies; Need for Water Management; Sources of Water Pollution; Measurement of Water Pollution

UNIT:II :

Sewage/Waste water treatment - collection, Primary treatment, Secondary treatment –Aerobic process: Activated sludge, Oxidation ditches, Trickling filters, towers, rotating discs, rotating drums, oxidation ponds. Anaerobic processes: Anaerobic digestion, Anaerobic filters, Tertiary treatment. Waste water treatment for some industries - dairy, distillery, tannery, sugar, antibiotic industries.

UNIT:III

Biopesticides and biofertilizers; their role in pest and nutrient Management; Wormiculture
Solid Wastes: Sources and Management; Composition; Methane Production; Food, Feed and Fuel from Biomass

UNIT:IV

Degradation of Xenobiotic Compounds in Environment: Decay Behaviour and Degradative Plasmids; Hydrocarbons; Substituted Hydrocarbons; Oil Pollution; Surfactants; Bioremediation of Contaminated Soils

UNIT – V

Global environmental problems: Ozone depletion, Green house effect and acid rain, their impact and biotechnological approaches for management. Environmental protection agencies

REFERENCES

1. Biotechnology - U.Sathyanarayana 2008
2. Environmental Biotechnology - Bruce E.Rittmann and Perry L.McCarty.2001.

Discipline Specific Elective - II

Course Code	Course Title	L	T	P	C
20117DSC63B	Pharmaceutical Biotechnology	4	1	0	3

Aim: To understand the various techniques in biotechnology and their applications.

Course objective:

- To sensitize the students to the fact that as we go down the scale of magnitude from cells to organelles to molecules
- To understanding of various biological processes becomes deeper and inclusive
- To educate students about the fundamental concepts of bioprocess technology and its related applications

Course outcomes:

Students should be able to:

- Know the significance and application of biotechnology in healthcare sector
- Appreciate relevance of microorganisms from industrial context
- Explain and apply design and operations of various fermenters; the fundamental principles for basic methods in production technique for biobased products
- Explain and apply of important microbial/enzymatic industrial processes

UNIT-I

Biotechnology in the Pharmaceutical Industry: Introduction - cell chemistry and biosynthesis; chemical organization of cells; internal organization of the cell - cell membranes; Cell cycle and its regulation; cell division: mitosis, meiosis and cytokinesis; cell differentiation: stem cells, their differentiation into different cell types and organization into specialized tissues; Cell-ECM and cell-cell interactions; cell receptors and trans-membrane signaling; cell motility and migration; cell death: different modes of cell death and their regulation.

UNIT-II

Genetic manipulation methods: Genetic manipulation in bacterial, plant and animal cells: Natural recombination in bacterial cells, Principles of Recombinant DNA Technology; Vectors and types, expression systems, molecular biology methods to study recombinant biomolecules, Plant Transformation methods: Agrobacterium mediated transformation; Hairy root culture; Plant products of industrial importance, Production of secondary metabolites; Accessing germline of animals; transfection methods of animal cells, Non-transgenic Methods of Animal Manipulation.

UNIT-III

Basic principles of biochemical engineering: Isolation, screening and maintenance of industrially important microbes; strain improvement for increased yield and other desirable characteristics. Microbial metabolites: Industrially important microbial metabolites: Process technology for the production of primary metabolites eg. citric acid, lactic acid, amino acids,

polysaccharides, nucleosides and bioplastics; Production of secondary metabolites- penicillin, cephalosporins, streptomycin, vitamins etc.

UNIT-IV

Fermentation technology and bioreactors: Batch and continuous fermenters; modifying batch and continuous reactors: chemostat with recycle, multistage chemostat systems, fed-batch operations; conventional fermentation, biotransformations; large scale animal and plant cell cultivation; upstream processing: media formulation and optimization; sterilization; aeration, agitation and heat transfer in bioprocess; scale up and scale down; measurement and control of bioprocess parameters.

UNIT-V

Enzyme fermentation using immobilized enzymes: Different techniques of immobilization of enzymes and whole cells; Advantages and disadvantages of immobilization, Application and future of immobilized enzyme technology. Application of fermentation technology in producing compounds of pharmaceutical interests: Therapeutic proteins, Vitamins, Amino acids, Monoclonal Antibodies

Reference:

1. Current Pharmaceutical Biotechnology (2022). By Veysel Kayser.
2. Pharmaceutical Biotechnology: An Introduction for Pharmacists and Pharmaceutical Scientists 1st Edition (1997) by J. A. Crommelin Daan (Author), Robert D. Sindelar (Author), Daan J.A. Crommelin (Author).
3. Pharmaceutical Biotechnology: by Prof.Dr. Oliver Kayser, Prof.Dr. Heribert Warzecha, (2012).
4. Walsh Gary. Pharmaceutical Biotechnology – Concepts and Applications. By Wiley, Chichester, West Sussex (2007).
5. Pharmaceutical Biotechnology Fundamentals and Application: by Dr Chandrakant Kokare (2013).
6. Textbook of Pharmaceutical Biotechnology: by Kokate (2011).
7. Pharmaceutical Biotechnology: by K. Sambamurthy, Ashutosh Kar (2009).

AUDIT COURSE					
201ACLSCET	Community Engagement	-	-	-	1

Aim:

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of Learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

Open Elective

Course Code	Course Title	L	T	P	C
201ENOEC	Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism

Objective:

- To instil in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub-editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist
- Explore the different kinds of news

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub-editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		

Course code	Course Title	L	T	P	C
201MAOEC	Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, "Operations Research"

Course Code	Course Title	I	T	P	C
201PHGEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.

UNIT – I: INTRODUCTION

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin’s and Norton’s theorem – Bridges :
AC bridges – Maxwell, Owen, Schering and deSauty’s bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhmey – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	Course Title	I	T	F	C
201CEOEC	Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislative aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types. High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

Introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	I	T	F	C
201CSOEC	E Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

Course Code	Course Title	L	T	P	C
201CAOEC	Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Introduction to the Internet: networking- internet – email – Internet Technologies: modem internet addressing .

UNIT II

Internet browsers: Internet Explorer – Netscape navigator- Introduction to HTML: Html document – anchor tag – hyperlink.

UNIT III

Head and body sections: Header section – titles – links- colorful web page – sample html document – Designing the body section: paragraph – tab setting.

UNIT IV

Ordered and unordered lists: list – unordered list – heading in a list- order list- nested list.

UNIT V

Table handling: tables – table creation in html cell spanning multiple rows and columns- coloring cells- sample tables- frames frame set definition- nested frames set.

REFERENCE BOOKS

1. World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
201CMOEC	Open Elective – Banking Service	4	0	0	2

AIM:

To Provide the Bank is a financial institution which is involved in borrowing and lending money.

OBJECTIVE:

- To provide lending money to firms, customers and home buyers.
- To provide keep money for customers
- To offer financial advice and related financial services, such as insurance.

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits-Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking-Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features- Registration-Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM-Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking,

ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose

various types of risk based by banks

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh,Justin paul .



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UNIVERSITY
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1.1.2 Total number of courses having focus on employability/ entrepreneurship/ skill development offered by the University during the year

SCHOOL ARTS AND SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

M.Sc. BIOTECHNOLOGY CURRICULUM

REGULATION 2020



DEPARTMENT OF BIOTECHNOLOGY

M. Sc - BIOTECHNOLOGY

PROGRAMME OUTCOMES	
PO1	Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life
PO2	Understanding and better knowledge of the causes, types and control methods for environmental pollution by the students
PO3	The student will be able to discuss the mechanisms associated with gene expression system in prokaryotes and eukaryotes
PO4	Developed various communication skills such as reading, listening, speaking etc.,
PO5	Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments
PO6	Ethics: Convey and practice social, environmental and biological ethics
PO7	To get knowledge about research tools and learn to do review literature. Ability to carry out independent literature survey corresponding to the specific publications type and asses basic research tool
PROGRAM SPECIFI COUTCOME	
PSO1	Graduates will exhibit contemporary knowledge in Biotechnology and students will be eligible for doing jobs in pharmaceutical and biotechnological Industry.
PSO2	An expert in biotechnology and allied fields (medical, microbial, Agricultural, environmental, plant and animal) for utilizing the practical skill to address biotechnological challenges.
PSO3	Graduates will be able to work individually as well as in team to survive in multidisciplinary environment.
PSO4	If students will engage themselves in the process of effective learning, it will give opportunities to utilize acquired knowledge for the catering the needs of science and technology as well as for the betterment of human mankind.
PSO5	Graduates will be able to understand the potentials, and impact of biotechnological innovations on environment and their implementation for finding sustainable solution to issues pertaining to environment, health sector, agriculture, etc.
PROGRAM EDUCATIONAL OBJECTIVES	
PEO1	To obtain detailed information about the fundamentals of Biotechnology, allied subjects and life skills
PEO2	To provide information about the molecular methods which involved in cellular processes of living systems such as microbes to higher order organisms for applied aspects. To address the emerging need for skilled scientific manpower with research ethics involving organisms
PEO3	To impart the basics and current molecular tools in the areas of Molecular Diagnostics, Fermentation Technology, Plant, Animal & Environmental Biotechnology are included to train the students for man power development and also sensitize them to scope for research. The practical subjects will provide information about the careers in the industry and applied research where biological system is employed
PEO4	To make the graduates of Biotechnology to learn and to adopt in a competitive world of technology update and contribute to all forms of life
PEO5	To enable them to excute a research objective through experimentation

POs/PEO	PO1	PO2	PO3	PO4	PO5
PEO1	*	*		*	
PEO2			*	*	*
PEO3		*		*	
PEO4	*	*			*
PEO5			*		

Course Code	Course Title	L	T	P	C
SEMESTER I					
20217SEC11	General Microbiology	6	1	0	5
20217SEC12	Molecular Genetics	6	1	0	5
20217SEC13	Biochemistry	6	1	0	4
20217SEC14L	Microbiology & Molecular Genetics – Lab	0	0	4	2
20217DSC15_	Discipline specific elective I	5	0	0	4
20217RLS16	Research Led Seminar	-	-	-	1
	Total	23	3	4	21
SEMESTER II					
20217SEC21	Cell & Molecular Biology	5	1	0	5
20217SEC22	Biophysics & Bioinformatics	5	1	0	5
20217SEC23	Industrial Biotechnology	5	0	0	4
20217SEC24L	Molecular Biology & Industrial Biotechnology – Lab	0	0	4	2
20217DSC25_	Discipline specific elective II	5	0	0	4
20217RMC26	Research Methodology	3	0	0	2
20217BRC27	Participation in Bounded Research	-	-	-	2
	Total	23	2	4	24
SEMESTER III					
20217SEC31	Genomics	6	1	0	6
20217SEC32	Proteomics	6	1	0	6
20217SEC33L	Genomics & Proteomics - Lab	0	0	5	3

20217DSC34_	Discipline specific elective III	5	0	0	4
202_OEC	Open Elective	4	0	0	3
20217SRC35	Design\socio technical research	-	-	-	2
	Total	21	2	5	24
	SEMESTER IV				
20217SEC41	Food Technology	6	1	0	6
20217SEC42	Bio instrumentation	6	1	0	6
20217SEC43L	Food technology and Bio instrumentation lab	0	0	5	3
20217DSC44	Discipline specific elective IV	5	0	0	4

20217PRW45	Project work	-	-	-	6
20217PEE	Programme Exit Examination	-	-	-	2
	Total	17	2	5	27
	Total Credits for the Programme				96

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a)20217DSC15A- Immunology b)20217DSC15B- Biosafety and biodiversity
	Discipline specific Elective Courses-II
II	a)20217 DSC25A- Endocrinology b)20217 DSC25B- Bioethics and IPR
	Discipline specific Elective Courses-III
III	a)20217 DSC34A- Nanobiotechnology b)20217 DSC34B- Environmental biotechnology
IV	Discipline specific Elective Courses-IV
	a)20217 DSC44A- Gene therapy utilization pharmacology b)20217 DSC44B- Plant conservation & disaster management

Open Electives

Semester	Open Elective Courses
III	a) 202ENOEC-Writing for the media b) 202MAOEC-Applicable Mathematics Techniques c) 202PHOEC-Bio-Medical Instrumentation d) 202CHOEC-Green Chemistry e) 202CSOEC – M-Marketing f) 202CMOEC- Financial Services

Credit Distribution:

Sem	SEC	DSC	OEC	RSB Courses	Others	Total
I	16	4	-	1	-	21
II	16	4	-	4	-	24
III	15	4	3	2	-	24
IV	15	4	-	6	2	27
Total	62	16	3	13	2	96

SEMESTER I

Course Code	GENERAL MICROBIOLOGY	L	T	P	C
20217AEC11		6	1	0	5

AIM:

- This paper provides the knowledge about different types of microorganisms and their identification techniques in modern biology and there by the usefulness of the techniques in research and commercial purposes.

OBJECTIVES:

- In order to make the students to understand the identification of microorganisms using advanced microbiological methods and applications of microorganisms.

OUTCOMES:

- Students can gain the idea of how to identify the microorganisms based on the modern polyphasic approach.

Unit I

Definition and historical account of microbiology. Diversified microbial world-Classification of microbes based on Whittaker's five kingdom system of classification. Structure of Algae, Bacteria, Fungi and Virus.

Unit II

Nutritional requirements and growth cycles of the above mentioned groups. Media for growth: Types, preparation, methods of sterilization. Isolation and enumeration of microorganisms in soli, water and air. Isolation of microorganisms from contaminated food. Techniques of pure culture, maintenance and preservation; staining: stains and dyes, types of staining; General techniques involved in Virology and Protozoology.

Unit III

Microbial physiology: Factors influencing the growth of microbes-classification based on the temperature, pH, nutrition, symbiotic associations, commensals, saprophytes, etc., Microbiology of fermented foods-dairy products, meat and fish, alcoholic beverages-beer, wine etc., Food spoilage and preservation process. Microbes as source of food. Application of microbes in industries production of antibiotics, amino acids, organic acids, bioconversion process, microbial insecticides.

Unit IV

Biochemistry of Metabolism: Carbohydrates and energy metabolism – fermentation and glycolysis, TCA cycle and oxidative phosphorylation, ammonia metabolism. Biosynthesis of glutamate. Purine and pyrimidine biosynthesis. Synthesis of DNA and RNA. Biosynthesis of cell wall – Peptidoglycan and Teichoic acid.

Unit V

Microbes as components of the environment – nutrient cycles – C, N, S, H, O, Mn, K, Mg, Cl and phosphorus cycles, Degradation of industrial wastes, petroleum hydrocarbons, pesticides, biofouling and corrosion. Bacterial photosynthesis, symbiotic and non-symbiotic nitrogen fixation, antimicrobial agents – structure of antibiotics, antibacterial and antiviral (function & mechanism of action)

Book references:

- Fundamental Principles of Bacteriology – A.J. Salle
- Microbiology – Michael J. Pelchar, E.C.S. Chan Noel R. Krieg.
- Microbial Physiology – Albert G. Moat and John W. Foster – Willey – Interscience Publication
- Food Microbiology – W.C. Frazier and D.C. Westhoff, Tata Mcgrah Hill Publication
- Microbial Biotechnology – Alexander N. Glazer, Hiroshni-Kaido, W.H. Freeman and Co. 1995.
- Chemical Microbiology – Antony H. Rose, Butterworths, 3rd Edition, Plenum Press, 1976.

Course Code	Molecular genetics	L	T	P	C
20217AEC12		6	1	0	5

AIM:

- This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

OBJECTIVE:

- The major objective of the paper is to envisage thorough knowledge in genetics and genome organizations in organisms.

OUTCOME:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

Unit I

Gene as the unit of mutation and recombination. Identification of DNA as the genetic material. Mutations: Molecular nature, mutagenesis by nitrous acid, hydroxylamine, alkylating agents, intercalators and UV, origin of spontaneous mutations and control, parasexual process in bacteria, transformation, transduction and conjugal gene transfer the phenomena, mechanisms and applications. Fine structure genetic analysis with examples.

Unit II

Recombinations – Control, models and mechanisms. Gene as the unit of expression. Gene – cistron relationship in prokaryotes and eukaryotes. Colinearity of gene and polypeptide. Elucidation of the genetic code. Wobble base pairing. Suppression of nonsense, missense and frameshift mutations. Regulation of gene expression in prokaryotes and eukaryotes. The operon concept – positive and negative control, attenuation control. Control sequences, promoter, operator, terminator and attenuator, DNA methylation and epigenic regulation.

Unit III

DNA damage and repair DNA damage by UV, alkylating agents, cross linkers. Mechanisms of repair – photoactivation, excision repair, recombinational repair. The SOS and adoptive responses and their regulation, heat shock response.

Unit IV

Extrachromosomal heredity, Biology of plasmids – discovery, types and structure of RTF, col-factors and Ti. Replication and partitioning. Incompatibility and copy number control. Natural and artificial plasmid transfer and their applications. Transposable genetic elements: discovery, early experiments of McClintock in maize. Insertion sequences in prokaryotes. Complex transposons – Tn 10, Tn 5, Tn 9 and Tn 3 as examples. Mechanisms control, consequences and applications of transposition by simple and complex elements. Retro elements.

Unit V

Genetics of Eukaryotes: Gene linkage and chromosome mapping, crossing over, three point cross, tetrad analysis. Complementation. Organization of chromosomes, specialized chromosomes. Chromosome abnormalities, quantitative inheritance, population genetics. Developmental genetics using *Drosophila* as model system. Somatic cell genetics.

Reference Books:

- Microbial Genetics – S.R. Maloy, J.E. Cronan and D. Friefelde 1994. Jones and Barlett Publishers.
- Molecular Genetics of Bacteria – J.W. Dale 1994 John Willey and Sons.
- Concepts of Genetics – W.S. Klug and M.R. Cummings Prentice Hall, 1997.
- Introduction of Genetic Analysis of Griffiths – Freeman Co., 1996.
- Advanced Molecular Biology of the Gene – Watson J.D. Hopkins NH, Roberts, J.W. Steitz. J.A.

Course Code	BIOCHEMISTRY	L	T	P	C
20217SEC13		6	1	0	4

AIM:

- This paper presents the study of identification and quantitative determination of the substances, studies of their structure, determining how they are synthesized metabolized and degraded in organisms, and elucidating their role in the operation of the organism.

OBJECTIVE:

- On the successful completion of the course the students will get an overall understanding of structure of atoms, molecules and chemical bonds, enzyme kinetics, bio polymers and metabolic reactions in a living system.

OUTCOME:

- This paper in biochemistry has been designed to provide the student with a firm foundation in the biochemical aspects of cellular functions which forms a base for their future research.

Unit I

Principles of Bioenergetics. Glycolysis and carbolism of hexoses the citric acid cycle.Oxidation of fatty acids. Oxidation of amino acids. Oxidative phosphorylation.Glyoxylate cycle, TCA cycle, Kreb cycle, Pentose Phosphate pathway. Nitrogen cycle.

Unit II

Carbohydrate – types, structure and functions of carbohydrates,biosynthesis, lipidbiosynthesis, C2, C3, C4 cycles. Biosynthesis of fatty acids and triacyl glycerol.Secondary metabolites – occurrence, classification and functions of phenolics, terpenes,flavonoids, alkaloids, saponins, glycosides.Applications of secondary metabolites in food, dairy, agricultural, cosmetics and pharmaceutical Industries.

Unit II

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity,Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens.

Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

Unit III

Biosynthesis of amino acids, nucleotides and related molecules. Classification of proteins based on functions and solubility, types of proteins structure and functions. Chemical synthesis of peptides and oligosaccharides. A general account of secondary metabolic pathway.

Unit IV

Integration and hormonal regulation of mammalian metabolism. Biological membrane and transport. Enzymes classification, mechanism, factors affecting enzyme action Vitamins and minerals.

Unit V

Lipids classification, importance, fatty acids, essential non essential fatty acids. Prostaglandins, leukotrienes, thromboxanes, interferons and interleukins. Antibiotics, cytoskeletal organization, ribozymes.

Book references:

- Principles of Biochemistry – A.L. Lehninger, D.L., Nelson and MM Cox 1993 Wokrth Publishers, New York.
- Biochemistry – L. Styler 1994 Freeman & Co New York. .
- Biochemistry – G. Zubay 1988 macmillan Publishing Co New York and Business

Course Code	MICROBIOLOGY & MOLECULAR	L	T	P	C
20217SEC14L	GENETICS LAB	0	0	4	2

- AIM: This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

OBJECTIVE:

- The major objective of the paper is to envisage thorough knowledge in genetics and genome organizations in organisms.

OUTCOME:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

1. Culture media preparation liquid and solid media.

2. Selective differential media

3. Methods of sterilization and testing of sterility

4. Enumeration of bacteria, fungi and actinomycetes from soil

5. Pure culture techniques – Pour, spread and looping methods

6. Maintenance and preservation of cultures

7. Staining of Bacteria – gram, spore and AFB, Fungal wet mount – LPB

8. Motility test – hanging drop and soft agar inoculation

9. Water quality test – MPN

10. Effect of different parameters on bacterial growth kinetics (Substrate, pH,

Temperature)

11. Single colony – isolation and checking for genetic markers, measurements of growth rate one step growth curve using T7 phage.

12. Induced mutagenesis and isolation of antibiotic resistant and auxotrophic mutants

enrichment methods for auxotrophic and antibiotic resistant mutants.

13. Genetic mapping by p1 transduction, genetic mapping of conjugation and transformation.

14. Transposon mutagenesis of chromosomal DNA, Transposon mutagenesis of plasmid DNA

15. Experiments with gene fusion.

Book references:

1) Sadasivam, S. and Manickam A. Biochemical Methods, 2nd Edition, New age International Private Ltd. Publishers.

2) Laboratory Techniques in Biochemistry and Molecular Biology.

3) A short Course in Bacterial Genetics – J.H. Miller 1992, Cold Spring Harbour Laboratory.

4) Methods for Genetics and Molecular Bacteriology – RGF Murray, W.A. Wood & N.B. Krig 1994 American Society for Microbiology.

Course Code	DISCIPLINE SPECIFIC ELECTIVE I	L	T	P	C
20217DSC15A	Immunology	5	0	0	4

AIM:

- Understanding the immune system, antigen antibody reactions, applications of immunological techniques, humoral and cell mediated immunity, hypersensitivity reactions and hybridoma technology.

OBJECTIVE:

- To expose the students with various immune systems of human body.

OUTCOME:

- This course will provide the student insights into the various aspects of Immunology such as classical immunology, clinical immunology, Immunotherapy and diagnostic immunology.

Unit I

Molecular cells & organs of Immune system, Historical perspective, Innate Immunity:-Skin, Mucosal Surface, Physiological barrier, Inflammation, Adaptive Immunity, Molecules of innate & Acquired immune system:- Complement, Interferon, other molecules Cells of Innate & Acquired Immune system. Organs of the immune system:-Primary Lymphoid organs, Secondary Lymphoid organs, Lymphatic etc.

Unit II

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity, Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens. Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

Unit IV

MHC & Transplantation Immunology - MHC:- General organization, MHC molecules & genes, Cell recognition of self & nonself, MHC restriction, Tolerance:- Central Peripheral & acquired tolerance. HLA typing methods using serological and molecular techniques.

Unit V

The Immune system in Health & Disease, AIDS & other Immunodeficiencies, Autoimmunity &

autoimmune diseases. Hypersensitivity, Vaccines:- Principle & types of vaccines, Recent advances in vaccination, Monoclonal & Recombinant antibodies. Immunological techniques: RIA, ELISA, Immunocytochemistry, Immunoblotting, Fluorescence antibody techniques.

- **Book references:**

- Immunology – An Introduction, Tizard R. Jan, 1995 Immunology – Roitt Ivan, Jonathan Brastoff, David Male, 1993.
- Immunology – Janis Kubey, 3rd Edition.
- Text Book of Microbiology – Anathanarayanan R and Jayaraman Panikar, 1996.
- Immunology – Weir D.M. and Steward, J. 1997. 8th Edition Churchill Livingstone
New York

Course Code	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	C
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AIM:

- This course has been designed to provide the student insights into these invaluable areas of biotechnology, which play a crucial role in determining its future use and applications.

OBJECTIVE:

- Students get an idea about the advantages and disadvantages of biotechnological applications, ethical implications, and intellectual property rights.

OUTCOME:

- To study the diversity of plants and animal life in a particular habitat, ethical issues and potential of biotechnology for the benefit of man kind

Unit 1:

Introduction and historical background. Introduction to biological safety cabinets, primary containment for biohazards, biosafety levels, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals. Biosafety guidelines by Government of India. Definition of GMOs and LMOs.

Unit 2:

Environmental release of GMOs, risk assessment; risk management and communication. Overview of national regulations and relevant international agreements including Cartagena protocol.

UNIT 3 :

Biodiversity – Concept and Definition Scope a**Unit II**

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity, Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens. Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Constraints of Biodiversity Science, Composition and Scales of Biodiversity: Genetic Diversity, Species/ Organismal Diversity, Ecological/ Ecosystem Diversity, Landscape/ Pattern Diversity,

Agrobiodiversity, Biocultural Diversity and Urban Biodiversity.

UNIT 4 :

Values of biodiversity Instrumental/Utilitarian value and their categories, Direct use value; Indirect/ Non-consumptive use value, Introduction to Ecological Economics; Monetizing the value of Biodiversity; Intrinsic Value; Ethical and aesthetic values, Anthropocentrism, Biocentrism, Ecocentrism and Religions; Intellectual Value; Deep Ecology.

UNIT 5 :

Threats to biodiversity Habitat Destruction, Fragmentation, Transformation, Degradation and Loss: Causes, Patterns and consequences on the Biodiversity of Major Land and Aquatic Systems Invasive Species' pathways, biological impacts on terrestrial and aquatic systems.

Extinction: Types of Extinctions, Processes responsible for Species Extinction, Current and Future Extinction Rates, IUCN Threatened Categories, Sixth Extinction/Biological Crisis.

REFERENCES

- Groom MJ, Meffe GR and CR Carroll, (2006). Principles of Conservation Biology. Sinauer Associates, Inc., USA
- Krishnamurthy KV, (2003). Textbook of Biodiversity. Science Publication
- Primack R, (2014). Essentials of Conservation Biology. Sinauer Associates,
- Hambler C and SM Canny, (2013). Conservation. Cambridge University Press.
- Van Dyke F, (2008). Conservation Biology Foundations, Concepts, Applications 2nd Edition,

Course Code	CELL & MOLECULAR BIOLOGY	L	T	P	C
20217AEC21		5	1	0	5

AIM:

- This paper provides a thorough knowledge about structure and function of cells, cellular energetics, protein trafficking, bio molecules and cellular development.

OBJECTIVE:

- Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

OUTCOME:

- Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields.

UNIT-I:

Cell architecture: Structure of cells – structure of prokaryotic and eukaryotic cells; Surface appendages – Cilia and Flagella, Capsules, Pili, Fimbriae and slime layers; Cell walls – Algae, fungi, bacteria ; Membranes of Gram positive, Gram negative bacteria and acid fast bacteria; protoplast, spheroplast and endospores; Transport across membrane – active and passive transport, transport channels and pumps, transport across nuclear membrane; Neurotransmission, neuromuscular junction.

UNIT-II:

Cellular constituents: Cytoskeleton and structural components – Microfilaments, Intermediate filaments, Microtubules; Mitochondria – structure, biogenesis; Chloroplast – structure, biogenesis; Endoplasmic reticulum and Golgi complex – structure, function, vesicular transport and import into cell organelles; Structure and function of ribosomes, mesosomes, lysosomes, peroxysomes.

UNIT-III:

Nucleus: Nucleus structure – structural organization, nucleosome, supranucleosomal structures, specialized chromosomes, polytene and lamp brush chromosomes and chromosome banding; Nucleic acid structure: DNA and RNA.

UNIT-IV:

Cell cycle: Mechanism of cell division – Mitosis, meiosis and genetic recombination; regulation of cell cycle – factors and genes regulating cell cycle (Cyclins, CDK and CDKI). Biochemistry and molecular biology of Cancer – malignant growth, tumour suppressor genes (p53, RB) and oncogenes (Ras), chemical carcinogenesis, hormonal imbalances.

UNIT-V:

Cellular development: Extracellular matrix – cell to cell and cell-matrix adhesion, cell junctions; Cellular systematic – components of systematic, receptors (cell surface – GPCR, RTK, TGF- β , Hedgehog, Wnt, Notch-Delta, NF-K β , ion channels; intracellular – NO, Nuclear receptor), secondary messengers, effectors ; cell differentiation; gametogenesis and fertilization; development of Drosophila and Arabidopsis – spatial and temporal regulation of gene expression.

REFERENCES

- Introduction to genetics: A molecular approach, T.A. Brown, Garland Science, 2011.
- Molecular Biology of the Gene (7th Edition, J.D.Watson, Tania A. Baker, Stephen P. Bell
- Michael Levine, Richard Losick) Benjamin/Cummings Publ. Co., Inc., California, 2013
- Genes XI (9th Edition) Benjamin Lewin, Jones & Bartlett Learning, 2008
- Molecular biology and Biotechnology. A comprehensive desk reference, R.A. Meyers (Ed) Wiley-Blackwell Publishers, 1995

Course Code	BIOPHYSICS & BIO INFORMATICS	L	T	P	C
20217AEC22		5	1	0	5

AIM:

- Biology is fast becoming an interdisciplinary science. There is accumulation of large amount of information in different areas of biology - on genome sequences of many organisms, genetic and biochemical interaction networks, cell interactions during development, and organism response to environmental stimuli, along with molecular understanding of diseases. This has led to the

emerging need for a holistic description of the working of biological systems at different scales.

OBJECTIVES:

- To gain an appreciation for the field of systems biology. To understand and learn the technical details of several current experiments or technologies used in the field of systems biology. To understand some of the larger questions and issues with systems biology and large-scale data collection and analysis.

OUTCOMES:

- This paper has been designed to give the students comprehensive training in the emerging and exciting upcoming field of Systems Biology, which will help students to get career in both Industry/R&D.

UNIT-1

Physics and biology: scope and methods of biophysics. Levels of molecular organization. Association of macromolecules, lipids in biological membranes. Protein in biological membranes. Molecular machines and dynamics.

UNIT-II

Understanding structures of proteins at different levels.- primary, secondary, tertiary and quaternary: conformational analysis and forces. Understanding structures of nucleic acids at different levels- primary, secondary, tertiary and quaternary: conformational analysis of interactions- polysaccharides

UNIT-III

Introduction to Bioinformatics-scope and application characteristics of hardware and software. Types of computer, Bio-chips, computer network sending and receiving e-mail. Internet browsing- searching biological articles information in internet.

UNIT-IV

Computer applications in biology- uses of databases in biology- analysis of proteins and nucleic acid sequence- molecular modeling- introduction to data processing- files- data collection- preparation-editing- backup- file recovery-procedure-sorting-searching and merging.

UNIT-V

Biomolecules- carbohydrate, protein, lipids and nucleic acids, protein conformation-prediction of protein structure-fold recognition, comparative modeling (homology)-basic principles of X-ray diffraction studies, NMR, Mass spectroscopy in identifying protein information.

Reference books:

- Introduction to protein structure by C. Branden and J. Tooze(1991) Garland publishing company

- Biochemistry by L.Stryer. (1995) WH freeman and co.
- Biophysical chemistry part-I& III by cantor amd schimmel(1980) WH freeman and co.
- Biophysics and bio physical chemistry by debajyoti Das (1987) academic press.
- Molecular databases for protein sequence and structure studies by sillinee. JA and sillince .M (1991) spring verlag.
- Sequence analysis primer by M. Gribskov, J.Dvvereux()1989 stockton press.

Course Code	INDUSTRIAL BIOTECHNOLOGY	L	T	P	C
20217AEC23		5	0	0	4

AIM:

- To understand the, environmental pollution and remediation using Biotechnology and its control.

OBJECTIVE:

- Students will get an idea about the hazards to our environment, solutions to protect it and for sustainable development.

OUTCOMES:

- This course is important in the era of industrialization leading to environmental hazards and hence will help students to take up a career in tackling industrial pollution and also to take up the research in areas like development of biological systems for remediation of contaminated environments (land, air, water), and for environment-friendly processes such as green manufacturing technologies and sustainable development.

UNIT-I

Industrial microbiology an introduction- modern fermentation process and biochemical engineering- isolation, screening and strain improvement of microorganisms.

UNIT-II

Media design and sterilization for fermentation processes- media requirements for fermentation processes- examples of simple and complex media. Design and usage of commercial media for industrial fermentations- batch and continuous fermentations system- sterilization system of liquid media and air.

UNIT-III

Basic principles of bioprocess-media formulation- fermentation equipment and its use- type of fermentor (Batch and continuous fermentor) and its application. Tray, CSTR, BCF, HFMB, RBC and inner and outer loop.

UNIT-IV

Traditional industrial process – anaerobic process ethanol, lactic acid, acetone- butanol production)- aerobic process (citric acid baker’s yeast penicillin production).

UNIT-V

Medical application of bioprocess engineering- commercial tissue culture process- gene therapy using viral vectors- models of viral infections- mass production of retrovirus. Advanced biological

waste water treatment applications

EMPLOYABILITY / ENTREPRENEURSHIP/ SKILL DEVELOPMENT

REFERENCES:

- Industrial microbiology by J.H patel
- Industrial microbiology by G.H casida

Course Code	MOLECULAR BIOLOGY & INDUSTRIAL BIOTECHNOLOGY lab	L	T	P	C
20217SEC24L		0	0	4	2

AIM:

This paper provides a thorough knowledge about structure and function of cells, cellular energetics, protein trafficking, bio molecules and cellular development.

OBJECTIVE:

Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

OUTCOME:

Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields

- Living cells preparation by histochemical techniques
- Microtomy
- Squash preparation of onion root tip
- Production of enzyme (amylase)
- Immobilization of cells and enzymes by calcium alginate method
- Effect of different parameters on bacterial growth kinetics (ph, temperature)
- Production of organic acid
- Immunocytochemical analysis for specific cellular constituents
- Cytochemical study of cells/ cell types using specific dyes reagents
- Estimation of protein and carbohydrates
- Alcoholic fermentation of fruit juice by yeast (*Saccharomyces cerevisiae*)
- Separation of amino acid by paper chromatograph.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

REFERENCE:

- Sadasivam.S and Manickam.A biochemical methods H Edition. New Age nternational PVT. Publishers.
- Boyer R. Modern experimental biochemistry, III edition, Benjamin cummings publishers.

Course Code	3825	L	T	P	C
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AIM:

This is a comprehensive study of the endocrine system which will allow the student to integrate and better understand the functions of the other systems of the body. The relationship of the nervous system to the endocrine system is explored in the context of signaling within a multicellular organism..

OBJECTIVE:

- To have a basic understanding of the endocrine system.

OUTCOMES:

- To know the pathophysiological significance of the system with special reference to humans.

UNIT-I

Hormones in general- definition- types of secretions- nature-classification, synthesis and their role- feedback control with specific examples hormone action proteins and steroids- cell signaling in hormone action

UNIT-II

Hypothalamo hypo physical axis – hormones of hypothalamus and their role structure of pituitary –secretions-physiological role- pathophysiology current status of pituitary as a master gland.

UNIT-III

Thyroid- parathyroid – structure- hormones- synthesis-storage-release-carrier proteins(eb. TBA&TBG)-physiological role-pathophysiology.

UNIT-IV

Adrenal and gonadal hormones- steroid biosynthesis- maintenance of cyclicity physiological role- pathophysiology- steroids in metabolism

UNIT-V

Gastro intestinal hormones-pancreas as an endocrine organ- secretions- functions-physiological role and pathophysiology other endocrine organs in vertebrates insect and crustacean hormones- their role in growth and metamorphosis.

REFERENCE:

- Text book of endocrinology-williams
- Physiological review of biochemistry-harper and others

Course Code	DISCIPLINE SPECIFIC ELECTIVE II	L	T	P	C
20217DSC25B	BIOETHICS AND IPR	5	0	0	4

AIM:

To acquire to acquire specialized knowledge of law and practice relating to Insurance.

OBJECTIVE:

- The aim of this paper is to introduce the basic concepts of Intellectual property laws to the students for first time and familiarize them with the kind of rights, remedies and licensing regime associated with each kind of intellectual property so that students can have a basic understanding of Intellectual Property laws.

OUTCOME:

- To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR'

Unit 1: Overview of Intellectual Property

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

Unit2: Patents

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit 3: Copyrights

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic

works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Unit 4: Trademarks

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

Unit 5: Other forms of IP

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI): Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection Plant Variety Protection

Plant variety protection: meaning and benefit sharing and farmers’ rights – Procedure for registration, effect of registration and term of protection Layout Design Protection

Layout Design protection: meaning – Procedure for registration, effect of registration and term of protection

.Reference book:

- V K Ahuja; Law relating to Intellectual Property Rights; Lexis Nexis, 2017 Reference
- **Journal:** 1. Journal of Intellectual Property Rights (JIPR); NISCAIR
- **Text book:** 1. Neeraj Pandey and Khusdeep Dharni; Intellectual Property Rights; PHI learning Pvt.Ltd., India 2014

Course Code		L	T	P	C
20217RMC26	RESEARCH METHODOLOGY	3	0	0	2

AIM:

- This course introduces and discusses approaches, strategies, and data collection methods relating to research in social sciences. Students will consider how to select the appropriate methodology for use in a study to be performed.

OBJECTIVE:

- This course aims to guide Master One students at the Section of English in the university of Biskra towards achieving competence and proficiency in the theory of and practice to research. This fundamental objective can be realised through helping these students to develop the subject of their research, encourage the formation of higher level of trained intellectual ability, critical analysis, rigour, and independence of thought, foster individual judgement, and skill in the application of research theory and methods, and develop skills required in writing research proposals, reports, and dissertation

OUTCOME:

- To culminate this final stage, students will learn to write a comprehensive research proposal that may be conducted in the future.

Unit I – Research

Selection of problem-stages in the execution of research: choosing a topic to publication- preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, Bibliography. Journal; standard of research journals – Impact factor.

Unit II: Statistical method

Measures of dispersion: Universe and population – delimiting population – sampling method – random sampling, stratified random sampling – types of variables: qualitative and quantitative variables – continuous and discontinuous variables – scaling method S- mean – standard deviation – standard error – coefficient of variation.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Unit III

Coparision of means, chisquard test, student test (ANOVA ‘portioning of variation). F test – model sums on one way ANOVA with interpretation of data – introduction to MANIVA – Statistical and their use – significance test and fixing levels of significance – use of statistical software like COSTAT and STATISTICA. Breif introduction to pie and histograms. Use of LCD.

UNIT IV:

Chromatography – priniciple, operative technique and applications of paper, TLC, adsorption chromatography, GLC and HPLC. Ion-Exchange, molecular sieve, Electrophoretic techniques – principle and technique of gel, SDS, high voltage and discontinuous electrophoresis, isoelectric focusing, plused field gel electrophoresis and capillary electrophoresis. Spectrometry –

Centrifugation techniques.

UNIT V:

Unit2: Patents

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit 3: Copyrights

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure. X-Rays
– X-Ray diffraction, crystals and detectors, quantitative analysis and applications. Radio chemical methods – Basic concepts, counting methods and applications. Autoradiography, detection and measurement of radioactivity, applications of radioisotopes in biology.

References:-

- An introduction to practical biochemistry by David T. Plummer.
- Laboratory Manual in Biochemistry by Pattabiraman and Acharya
- Practical Biochemistry by J. Jayaraman.
- Analytical Biochemistry, D. J. Homie and Hazel Peck, Longman group, 3rd edition, 1998.
- Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2nd Edition 1999.
- Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3rd 1999.
- Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2nd edition, Pp 160, ISBN: 081208005
- Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plagrave Macmillan, Pp256. ISBN 1403905843

Course Code	GENOMICS	L	T	P	C
20217AEC31		6	1	0	6

AIM:

- To study prokaryotic and eukaryotic genomes, general methods of genome sequencing techniques, genome analysis and annotations, genome mapping techniques and applications of genomics.

OBJECTIVE:

- Explain the aspects of genome organisation, analysis and applications.
- Provide the details of prokaryotic and eukaryotic genome.

OUTCOME:

- Acquire the aspects of Gene Contig and Shotgun method.
- Know the features of the Genome Mapping databases.

UNIT -I INTRODUCTION: Genome structure and anatomy of prokaryotic and eukaryotic genome – Nuclear genomes – Organelle genomes – Repetitive DNA sequence – Transposable elements– Pseudo genes – Genome databases – organisms-specific databases.

UNIT -II GENOME SEQUENCING DNA sequencing techniques: Maxam Gilbert method – Sanger's method – Pyrosequencing – Whole genome sequencing – Gene Contig and Shotgun method – Human genome project.

UNIT -III GENOME ANALYSIS AND ANNOTATION: Searching and locating Genes – Programs and databases – Determining function of genes – Gene Prediction – Methods of gene prediction – Softwares and tools.

UNIT -IV GENOME MAPPING: Mapping databases – Types of mapping – Genetic mapping: DNA markers – RFLP, SSLP, RH maps, SNP – Linkage analysis – Physical mapping: Restriction mapping – FISH – STS mapping

UNIT -V APPLICATIONS OF GENOMICS DNA: microarray and its applications – Medical applications: Development of Antibiotics – Vaccines – Drug discovery – Human genetics diseases: Identification – Gene Diagnosis and Gene therapy– Genomics in Plant Biology.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT**MATERIALS FOR STUDY AND REFERENCE:**

- Brown T.A., Genomes 3 (3rd Edn.), Garland Science Publishing, New York, 2007.
- Brown T.A., Gene Cloning and DNA Analysis – An Introduction (6th Edn.), A John Wiley & Sons, Ltd., Publications, UK, 2010.
- Jeremy W. Dale and Malcolm von Schantz, From Genes to Genomes – Concepts and Applications of DNA Technology, John Wiley & Sons, Ltd., Publications, UK, 2002.
- Richard J. Reece, Analysis of Genes and Genomes, John Wiley & Sons, Ltd., Publications, UK, 2004.

Course Code	PROTEOMICS	L	T	P	C
20217AEC32		6	1	0	6

AIM:

- To understand the proteins enclosed by the genes with respect to structure, function, protein – protein interactions, techniques for separation and analysis, database and applications.

OBJECTIVE:

- Give a detailed description on protein sequencing.
- Provide an overview of proteome databases.

OUTCOME:

- Gain knowledge on phylogenetic profiles
- Describe the features of Yeast two-hybrid system.

UNIT -I INTRODUCTION: Proteomics introduction – Protein sequencing – Protein Digestion Techniques – Mass Spectrometers for Protein and Peptide Analysis – Protein Identification by Peptide Mass Fingerprinting – Software Tools for Peptide Mass Fingerprinting: Finding the Matches – Peptide Sequence Analysis and Protein Identification with Tandem Mass Spectrometry

UNIT -II PROTEOME DATABASES: Proteome databases – Comparative proteomics methods – 2D gel databases – Protein interaction data bases – Metabolic pathway databases – resources for interaction prediction – network and pathway visualization tools – Protein network analysis

UNIT -III PROTEOMICS TOOLS : 2D gel electrophoresis and Mass spectra – Protein identification from 2D gel, mass spectra and sequence data – Protein property prediction – bulk, active sites, modification sites, interactive sites, location, localization, stability, shape, domains properties, secondary and tertiary structures – Protein identification programs – Muscot – PeptIdent – Protein prospector – GFS

UNIT- IV FUNCTIONAL PROTEOMICS Functional proteomics – protein phenotypes – Protein-Protein Interaction Mapping: Experimental – Yeast two-hybrid system – phage display – protein fragment complementation assays – Computational approach

UNIT -IV APPLICATION OF PROTEOMICS: Applications of Proteomics – Protein Expression Profiling – Identifying Protein – Protein Interactions and Protein Complexes – Mapping Protein Modifications – Protein Arrays and Protein Chips – Application of proteomics to medicine, toxicology and pharmaceuticals

UNIT -V Current Contours: (For Continuous Internal Assessment only) Computational Proteomics and Metabolomics- Sequence comparison. – Genome sequencing. – Proteomics. – Phylogeny. – Gene expression - Enzymology

MATERIALS FOR STUDY AND REFERENCE

- Baxevanis D and Ouellette BFF, Bioinformatics: A practical guide to the analysis of genes and proteins (3rd Edn.), John Wiley & Sons, 2005.

- . Baxevanis D and Ouellette BFF, Bioinformatics: A practical guide to the analysis of genes and proteins (2nd Edn.), John Wiley & Sons, Inc. 2002.
- Brown TA, Genomes (2nd Edn.), BIOS Scientific Publishers, Oxford, UK, 2002.
- Sensen CW, Essentials of Genomics and Bioinformatics, Wiley–VCH. 2002.
- Sensen CW, Hand book of Genome Research, Wiley–VCH Verlag GmbH & Co,

Course Code	Genomics & Proteomics - lab	L	T	P	C
20217SEC33L		0	0	5	3

AIM:

- The study of animal cells has helped us gain an insight not only in the structure and function of cells and tissues but also in different physiological, biochemical and immunological processes

OBJECTIVE:

- The major objective is to provide a world-class training experience for these students in an interdisciplinary research program connecting animal genomics with animal reproduction and biotechnology.

OUTCOME:

- This paper will help students interested in careers as laboratory, research or animal care technicians in the fields of veterinary and human health or biotechnology.

• Isolation of DNA from bacteria, fungus, animal tissues.

• Bacterial gene expression.

• Restriction mapping.

• PCR techniques.

• DNA finger printing PFLP, RAPD.

• Human Genome - Wellcome Trust Genome Browser

• FlyBase - A Database of Drosophila Genes & Genomes.

• Tandem repeats finder- A program to analyze DNA sequences

• PeptideCutter - Predicts potential cleavage sites cleaved by proteases or chemicals in a given protein sequence.

• PSORT - Program for the prediction of protein localization sites in c

• PROSITE - Protein Domain, Family & Functional Site Prediction

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT**REFERENCE:**

1. DNA cloning I & II by DM. Glover & BD. Hames(1995) IRL press.

2. PCR strategies by MA.Innis, DH.Gelfand & JJ. Sninsky (1995) academic press.
3. Concepts in biotechnology- editors D.Balasubramanian *et al.* university press,(1996).
4. Genetic engineering in animals. A.Puller(ed). VCH publishers.
5. BioEssays- K.K. Jain MD
6. Mapping of Genomes- Eric D. Green, Sue Klapholk.

Course Code		L	T	P	C
20217DSC34A	DISCIPLINE SPECIFIC ELECTIVE COURSE-III NANOBIOTECHNOLOGY 3835	5	0	0	4

AIM:

- One of major applications of nanoscience is in biotechnology field.

OBJECTIVE:

- nanotechnology attracts students from various disciplines, a single course which starts by sensitizing students from a varied background about the biological/biotechnological basics and culminates into modern day applications of nanoscience in biotechnology

OUTCOME:

- This course will act as a bridge between students from non-biology course at all levels

Unit- I

Basic biology principles and practice of micro fabrication techniques, Atomic force microscopy, biological production of metal nano particles, macro molecular assemblies.

Unit-II

Application in Biomedical and biological research, nano particles, viruses as nano- particles, nano chemicals and application., tumor targeting and other diagnostic application.

Unit-III

Developing drug delivery tools through nano biotechnology, nano particle based immobilization assays, quantum dots technology and its application.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT**Unit-IV**

Synthesis and characterization of different classes of biomedical polymers their uses in pharmaceutical, cardiovascular ophthalmologic orthopedic areas.

Unit-V

Biosensors and nano biotechnology principles used in construction of microelectronic devices sensors and macro mechanical structures.and their functioning, immunonanotechnology.

Textv Book:

- Nano Biotechnology by Balaji, Subbaih

Reference Books:

- Nanobiotechnology- concepts, applications and perspectives, niemeyer, christofm. Mirkin, chad a. wiley publishers.
- Nanobiotechnology of biomimetic membranes, martin, donald (edt), springer verlag publishers.

Course Code	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	C
20217DSC34B	COURSE-III Environmental biotechnology	5	0	0	4

AIM:

- To understand the energy sources, environmental pollution and remediation using biotechnology and its control.

OBJECTIVE:

- Students will get an idea about the hazards to our environment, solutions to protect and for sustainable development.

OUTCOME:

- This course is important in the era of industrialization leading to environmental hazards and hence will help students to take up a career in tackling industrial pollution and also who is willing to take up the research in areas like development of biological systems for remediation of contaminated environments (land, air, water), and for environment- friendly processes such as green manufacturing technologies and sustainable development

Unit I

Introduction, Importance and Scope of Environment Biotechnology. Renewable and Non-Renewable Resources of Energy. Conventional fuels and their impact on Environment – Firewood, Animal wastes, Coal, Petroleum and Animal oils.

Unit II

Modern fuels and their impact on environment – Methanogenic Bacteria, Biogas Production, Microbial Hydrogen Production, Conversion of Sugar to Alcohol, Gasohol. Effect of Green Revolution and Industrial Revolution on Environment.

Unit III

Waste Water Pollution (Sewage) Treatment Process - Septic tank, Mechanical and Biological Treatment, Trickling Filters, Activated Sludge Process, Oxidation Ponds, Anaerobic Sludge Digestion. Solid Waste Disposal- Sanitary Landfills, Composting, Vermicompost

Unit IV

Biofertilizers- Definition, Distinguished Features of Biofertilizers and Organic Manures. Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM).

Unit V

Bioleaching- Ore Leaching and Role of Microbes in Mines (copper, and Uranium). Environmental significance of Genetically modified microbes, plants and animals. Bio- assessment of environmental quality.

EMPLOYABILITY / ENTREPRENEURSHIP /SKILL DEVELOPMENT

Text Book:

- Fundamental of Environmental Studies by Bharrgava, D.S

Reference Books:

- John E Smith – Biotechnology, Cambridge University Press
- Prescott & Dunn - Industrial Microbiology, AVI publishing Co. USA
- Mukerji, Singh & Garg - Frontiers in applied Microbiology, Prink House India, Lucknow
Pepler & Perlman – Microbial Technology, Academic Presss, New York
- Nicholas C Price – Fundamentals of Enzymology Chaplin & Bueke – Enzyme technology
- Moses and Capes – Biotechnology- the Science and Business

Course Code	Course Title	L	T	P	C
202ENOEC	Open Elective -Writing for the Media	4	0	0	2

Aim:

- To equip students to enter the realm of mass media.

Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop- Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

References-

Journalism	-Susan
Professional Journalism	-John Hogenberg
News Writing and Reporting	-M.James Neal (Surjeet Publication)
Professional Journalism	-M.V Komath
The Journalist's Handbook	-M.V Komath
Mass Communication & Journalism	-D.S Mehta,

Course Code	Course Title	L	T	P	C
202MAOEC	Open Elective – Applicable Mathematical Techniques	4	0	0	2

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
202PHOEC	Open elective Biomedical Instrumentation	4	0	0	2

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

Outcomes:

- To familiarize students with various medical equipments and their technical aspects
- To introduce students to the measurements involved in some medical equipment.
- Ability to understand diagnosis and therapy related equipments
- Understanding the problem and ability to identify the necessity of an equipment to a specific problem

UNIT – I: Bio Electric Signals And Electrodes

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: Recording System And Recorders

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: Measurement And Analysis Techniques

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: Magnetic Resonance And Ultrasonic Imaging Systems

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – medical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: Advanced Bio Medical Systems

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
202CHOEC	Open Elective-Green Chemistry	4	0	0	2

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
 - To know about the Pollution and its prevention measures.
 - To familiarize the green chemistry.
 - To learn about the bio-catalytic reactions.
 - To understand about the vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
202CSOEC	Open Elective-M- Marketing	4	0	0	2

Aim :

- To provide the conceptual and technological developments in the field of internet and web designing with the emphasis on comprehensive knowledge of internet.

Objectives:

- To understand the web designing and web development with the knowledge of internet.
- To learn the overview of the design of HTML & Scripting Languages.
- To learn the use of website and internet design and development.

Outcomes:

- Acquire knowledge about functionalities of Internet
- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet. Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall

UNIT II

Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Servers, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.

UNIT III

Email Networks and Servers, Email protocols –SMTP, POP3, IMAP4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.

UNIT IV

HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames,

HTML Images, multimedia - ASP, VB Script, JAVA Script, JAVA and Front Page, Flash

UNIT V

Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptograms.

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

References

1. Greenlaw R and Hepp E “Fundamentals of Internet and www” 2nd EL, Tata McGrawHill,2007.
2. Ivan Bayross, “HTML, DHTML, JavaScript, Perl CGI”, 3rd Edition, BPB Publications.
3. D. Comer, “The Internet Book”, Pearson Education, 2009.
4. M. L. Young, ”The Complete reference to Internet”, Tata McGraw Hill, 2007.
5. Godbole AS & Kahate A, “Web Technologies”, Tata McGrawHill,2008.
6. Jackson, “Web Technologies”, Pearson Education, 2008.
7. B. Patel & Lal B. Barik, ” Internet & Web Technology “, Acme LearningPublishers.
8. Leon and Leon, “Internet for Everyone”, Vikas Publishing House.

Course Code	Course Title	L	T	P	C
20CM1OEC	Open Elective-Financial Services	4	0	0	2

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

- I. To gain knowledge on financial services.
- II. To understand importance of various services including banking, insurance, mutual

funds.

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents- Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview: Definition-Characterstistics-Objectives- Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market: Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-MajorIssues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

OUTCOME

To introduces meaning and functions of Financial IntermediariesTo understand the role of merchant bank and its services

To provide information regarding management of mutual funds and Regulations

To understand the role and functions of financial services MarketingTo know the structure and types of debt Instruments

To realize Foreign Exchange Market

REFERENCE BOOKS

1. Gordon , Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

SEMESTER IV

Course Code	FOOD TECHNOLOGY	L	T	P	C
20217AEC41		6	1	0	6

Aim: This course aims to help the students to understand the various properties of food and

the factors that make it vulnerable for spoilage

Objectives:

- This course is designed to understand the chemical nature and associated microbes of food and to understand the principles of food processing, preservation and manufacture.

Outcomes:

- To understand the basic food safety issues in the food market
- To develop and evaluate quality of new food products using objective and subjective methodologies.
- To understand the basic concepts in food chemistry and food analysis

Unit I

Basics of Food Technology Food chemistry: constituents of food - contribution to texture, flavour and organoleptic properties of food. Food additives - intentional and nonintentional and their functions. Enzymes in food processing.

Unit II

Microbiology of Food Sources and activity of microorganisms associated with food. Food fermentation & food chemicals. Food borne diseases - infections and intoxications. Food spoilage - causes.

Unit III

Food Processing Raw material characteristics; cleaning, sorting and grading of foods; physical conversion operations - mixing, emulsification, extraction, filtration, centrifugation, membrane separation, crystallization, heat processing.

Unit IV

Food Preservation Use of high temperatures - sterilization, pasteurization, blanching, canning - concept, procedure & application; Low temperature storage - freezing curve characteristics. Factors affecting quality of frozen foods. Irradiation preservation of foods.

Unit V

Manufacture of Food Products Bread and baked foods. Dairy products - milk processing, cheese, butter, ice-cream. Vegetable and fruit products. Edible oils and fats. Meat, poultry and fish products. Confectionery, beverages.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Reference Books

1. Crosby, N.T. 1981. Food packaging Materials Applied Science Publishers, London.
2. David, S. Robinson. 1997. Food Chemistry and nutritive value. Longman group, UK.
3. Frazier, W.C. and Westhoff, D.C. 1988. Food Microbiology,

Course Code	Course Title	L	T	P	C
20217AEC42	BIOINSTRUMENTATION	6	1	0	6

Aim:

- The students searching for Biomedical Instrumentation Courses and Training Programs found the following related articles

Objectives:

- This course will give an understanding about the working principles, construction and applications of the instruments often used in the studies related to various disciplines of Biological Sciences.

Outcomes:

- Check for analytical functions and find the analytical function and study .
- Learn the measurement systems, errors of measurement,
- Demonstrate basic knowledge of Biotechniques

Unit I

Basic Instrumentation (Theory & Demo) Principles, operation protocol & applications of the following instruments: Weighing balance, pH meter, Polarography, Radioactivity, ECG, FTIR.

Unit II

Microscopy (Hands on) Observation of different microbes. Light – Bright & Dark field; Phase contrast, Inverted Phase contrast; Fluorescent, Electron – TEM & SEM; Confocal

Unit III

Spectroscopy (Theory & Demo) Colorimeter, Spectrometer, UV visible spectrometer, X – ray spectrometer, ELISA reader, Atomic absorption spectrometer, Flame photometer, Flourimeter & Spectro flourimeter.

Unit IV

Separation Techniques (Theory & Demo) Centrifugation - Principle, operation, types & applications. Chromatography - Principle, operation & applications - Paper – ascending, descending & Circular, TLC, HPTLC, GC, HPLC, Column Chromatography, Ion Exchange & Affinity Chromatography, LC – MS.

Unit V

Electrophoresis (Theory & Demo) Native & denatured - zone, iso-electrofocusing & isotachopheresis, 1D & 2D. PCR, MoldiTof

- S.SadasivamA. Manickam. 2004. Biochemical Methods.
- 2nd Edition. New Age International (p) Ltd, Publishers. 2. Dr. G.Rajagopal, Dr. B.D.Toora. 2005. Practical Biochemistry. 2nd Edition. Ahuja Book Company Pvt.Ltd.
- J.Jayaraman. 2000. Laboratory Manual in Biochemistry. New Age International Publishers.

Course Code	Course Title	L	T	P	C
20217SEC43L	FOOD TECHNOLOGY AND BIO INSTRUMENTATION LAB	0	0	5	3

Aim:

- To understand the principle and application of Bioinstrumentation and food technology

Objectives:

- By doing this course the students will get hand on exposure & understand the chemical nature and associated microbes of food and the principles of food processing, preservation and manufacture. And the techniques used in understanding the biological process

Outcomes:

- Ability to apply principles of food engineering in industry.
- Understand, identify and analyze a problem related to food industry and ability to find an appropriate solution for the same.

1. Test for sensitivity of microorganisms.
2. Down stream processes of enzymes – dialysis.
3. Ion exchange chromatography – drying – cellulose column chromatography.
4. Immobilization of yeast cell by alginate beads
5. Bioassay techniques for antibiotics.
6. Large scale production of organic acids, large scale production of solvents using fermentor (Demo) Visit to Distillery unit; alcohol production and pharmacological industries. Pasteur Institute(Field visit).
7. Isolation & identification microbes from spoiled food.
8. Production of yogurt, butter.
9. Antibiotic production by different strains of microbes (Theory).
10. Calculate BMI
11. Handling of Colorimeter and Spectrophotometer

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

12. Estimation of RNA by orcinol method.
13. Estimation of DNA by Diphenylamine metho, Demonstratio
14. Paper chromatography for separations and detections of simple sugars and amino acids.
15. Separation of plant pigments by column chromatography.
16. Thin layer chromatography of amino acids.

Refrence book:

- Laboratory Mannual in Biochemistry by J. Jayaraman. New Age International Publishers. 2nd Edn. 1981.
- Stanbury, P.F., A. Whitaker ans S.J. Hall. 1995. Principles of fermentation Technology, Pergamon, UK.

Course Code	Course Title	L	T	P	C
20217 DSC44A	GENE THERAPY UTILIZATION PHARMACOLOGY	5	0	0	4

Aim:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

Objective:

- This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

Outcomes:

- understand some of the types of disease that might be treatable by gene therapy
- understand the basic principals of genetic manipulation
- Understand how genetics may be used in the design of drugs..

UNIT I: History of genetics

Gene as the unit of mutation and recombination. Identification of DNA as the genetic material. Mutations: Molecular nature, mutagenesis by nitrous acid, hydroxylamine, alkylating agents, intercalators and UV, origin of spontaneous mutations and control, parasexual process in bacteria, transformation, transduction and conjugal gene transfer the phenomena, mechanisms and applications. Fine structure genetic analysis with examples.

UNIT II: Genetic mapping

Haplotype, Physical and Cytogenetic mapping, SNP, RFLP, TRE, PCR-OLA, SSCP, RAPD

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

UNIT III: Identifying human disease genes

General gene therapy strategies, Targeted killing of specific cells, Targeted mutation correction, Targeted inhibition of gene expression. Gene replacement therapy by viral vectors: Oncovirus, Lentivirus, Adenovirus, Adenoassociated virus, Herpes Simplex virus, Naked DNA or direct injection or particle bombardment-gene gun, Liposome mediated DNA transfer, Receptor mediated endocytosis, Repair of mutations in situ through the cellular DNA repair machinery, Antisense induced exon splicing, In-utero fetal gene therapy

UNIT IV: Gene blocking therapies

Gene Knockouts, Gene disruption-p53, prion diseases, immunological, short RNA, Gene therapy for non-inheritable diseases, stem cell therapy, somatic cell gene therapy and germ line gene therapy

UNIT V: Gene therapy: problem, solutions and future prospects

Controversial issues in medical genetics

In vitro fertilization, Prenatal sex determination, Surrogate therapy, Genetic counseling, Germline gene therapy, ELSI, NBAC, IPR, Patenting, Human transgene

Reference Books:

- Human Molecular Genetics- Tom Strachan
- Concepts of Genetics- William s. Klug
- Emery's Elements of Medical Genetics- Robert F. Mueller & Ian D. Young
- Concepts of Genetics – W.S. Klug and M.R. Cummm Prentice Hall, 1997.
- Introduction of Genetic Analysis of Griffiths – Freeman Co., 1996.

Course Code	Course Title	L	T	P	C
20217 DSC44B	PLANT CONSERVATION & DISASTER MANAGEMENT	5	0	0	4

Aim:

- Understanding foundations of hazards, disasters and associated natural/social phenomena.

Objective:

- To maintain essential ecological processes and life supporting systems.
- To preserve the diversity of species or the range of genetic material found in the worlds organisms.
- The course focuses on the reasons responsible for disaster, its impact on the environment and society. To impart the knowledge on the measures and steps to minimise or overcome the burden on the ecosystem.

Outcomes:

- To make sustainable utilization of species and ecosystems.
- Familiarity with disaster management theory (cycle, phases) Knowledge about existing global frameworks and existing agreements (e.g. Sendai)

UNIT I: Plant Diversity

Biodiversity – Concept and Definition Scope and Constraints of Biodiversity Science, Composition and Scales of Biodiversity: Genetic Diversity, Species/ Organismal Diversity, Ecological/ Ecosystem Diversity, Landscape/ Pattern Diversity, Agrobiodiversity, Biocultural Diversity and Urban Biodiversity.

UNIT II: Conservation challenges in the twenty first century

Urbanisation; Creating knowledge society, Conflict management and decision making, Management of introduced species. 18 Evaluation of priorities for conservation of habitats and species Selection criteria for protection of species – species quality, IUCN Guidelines for Red List categories and criteria (version 7.0), Red List of Indian Flora and Fauna, Selection criteria for protection of habitats – hotspots, Conservation

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

UNIT III : Introduction to Disasters

Natural Disasters –Educative – Trends in Climatology, Meteorology and Hydrology. Seismic Activities. Changes in Coastal Zone, Coastal Erosion, Beach Protection. Coastal Erosion due to Natural and Manmade Structures.

UNIT IV : Types of Disasters – Natural

Disasters – Nature and characteristics of Cyclones – Tornadoes – Avalanches – Flood – Drought – Volcanic – Earthquakes – Fire – Landslides – Causes and effects - Impact on Environment- Forecasting and Warning System – Disaster Profile of India. Manmade disasters: Nuclear, chemical, fire explosion, accidents, bioweapons. Deforestation, monoculture, Building construction.

UNIT V : Disaster Management

Disaster Management Cycle- Predisaster Planning -Training of Disaster – Prone Areas – Prioritization – Regulations – Protection Measures during Disaster and Post Disaster. Relief Camp Organization — Disaster Training – Role of Information and Communication Technology, GPS, Remote Sensing and Geographic Information System in Disaster Management.

REFERENCES:

- Hambler C and SM Cannly, (2013). Conservation. Cambridge University Press
- Van Dyke F, (2008). Conservation Biology Foundations, Concepts, Applications 2nd Edition, Springer
- Natural Hazards, Bryant Edwards (2005), Cambridge University Press, U.K.
- Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Roy, P.S. (2000), Indian Institute of Remote Sensing (NRSA), Dehradun.
- Natural Disaster, Sharma, R.K. & Sharma, G. (2005), (ed) APH Publishing Corporation, New Delhi



M.PHIL – BIOTECHNOLOGY

COURSE STRUCTURE

PAPER- III - ENVIRONMENTAL BIOTECHNOLOGY (Sub. Code: 203BTE13)

UNIT – I

Environment: Basic concepts –Environmental Pollution: Types of pollution, Pollution monitoring and measurement; Methodology of environmental management – The problem solving approach and its limitations.

UNIT – II

Biofertilizers- Defination, Distinguished Features of Biofertilizers and Organic Manures. Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilixers (VAM). Bioleaching- Ore Leaching and Role of Microbes in Mines (copper, and Uranium). Environmental significance of Genetically modified microbes, plants and animals. Bio- assessment of environmental quality.

UNIT – III

Sewage/Waste water treatment - collection, Primary treatment, Secondary treatment –Aerobic process: Activated sludge, Oxidation ditches, Trickling filters, towers, rotating discs, rotating drums, oxidation ponds. Anaerobic processes: Anaerobic digestion, Anaerobic filters, Tertiary treatment. Waste water treatment for some industries - dairy, distillery, tannery, sugar, antibiotic industries. Water recycling.

UNIT – IV

Solid waste treatment and disposal - : Sources and management - Composting, vermiculture and methane production. Biodegradation and bioremediation - Xenobiotics Hydrocarbons, oil pollution, surfactants, pesticides.

UNIT – V

Global environmental problems: Ozone depletion, Green house effect and acid rain, their Bioremediation of contaminated soils and waste land.

Paper II ADVANCED BIOTECHNOLOGY (Sub. Code: 203BTC12)

UNIT – I

INTRODUCTION TO GENETIC ENGINEERING

Salient features of cloning vectors, restriction enzymes and their mode of action, recombinant DNA- types of cloning vectors, plasmids, cosmids, M-13 Phage. Microinjection, particle bombardment, electroporation (Vector less mode), Construction of genomic DNA library and cDNA library.

UNIT– II

PLANT BIOTECHNOLOGY

Vectors for gene transfer (Ti , Ri plasmids, cointegrate, intermediate and helper plasmids) Binary vectors, viruses as vectors gene transfer techniques using Agrobacterium, selectable markers, reporter genes and promoters , transgenic plants, crop improvement , resistance to herbicide insects, pests and viruses, cytoplasmic male sterility, delayed fruit ripening, antibody vaccine and interferon production in plants, synthetic seeds.

UNIT – III

BIOPROCESS

Bioreactor designs and types of fermentation and fermentors. Concepts & basic modes of fermentation - Batch, fed batch and continuous fermentation. Conventional fermentation versus biotransformation. Solid substrate, surface and submerged fermentation. Fermentation economics and fermentation media. Fermenter design - mechanically agitated, pneumatic and hydrodynamic fermenters. Large scale animal and plant cell cultivation and air sterilization. Upstream processing - media formulation, sterilization, aeration and agitation. Measurement and control of bioprocess parameters, scale up and scale down process

UNIT- IV

TECHNIQUES IN BIOTECHNOLOGY

PCR- key concept- applications- PCR variants- analysis of amplified product by gel electrophoresis- Nucleic acid blotting techniques- sequencing – Sangers method, Maxam and Gilbert method- primer walking- automated sequencing- DNA chips and microarray-DNA fingerprinting.

UNIT – V

BIOTECHNOLOGY – INTELLECTUAL PROPERTY

- i) Intellectual property of rights, patents, trade secrets, copyrights, trade mark, choice of Intellectual Property Protection (IPR), and Plant genetic Resources (PGR), GATT (Genetic Agreement of Tariff and Trade), TRIP (trade Related Intellectual property).
- ii) Patents for higher plants, patenting transgenic organism and isolated genes, patenting genes and DNA sequences, Plant Breeders Rights (PBR) and farmers Right.
- iii) Ethical issues in animal biotechnology. Management aspects of biotechnology and genetic engineering.



PRIST
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1.1.2 Total number of courses having focus on employability/ entrepreneurship/ skill development offered by the University during the year

SCHOOL ARTS AND SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

M.Sc. BIOTECHNOLOGY CURRICULUM

REGULATION 2020

EMPLOYABILITY
SKILL DEVELOPMENT
ENTREPRENEURSHIP
EMPLOYABILITY/ SKILL DEVELOPMENT



PRIST
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THANJAVUR – 613 403 - TAMILNADU

DEPARTMENT OF BIOTECHNOLOGY

M. Sc - BIOTECHNOLOGY

PROGRAMME OUTCOMES	
PO1	Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life
PO2	Understanding and better knowledge of the causes, types and control methods for environmental pollution by the students
PO3	The student will be able to discuss the mechanisms associated with gene expression system in prokaryotes and eukaryotes
PO4	Developed various communication skills such as reading, listening, speaking etc.,
PO5	Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments
PO6	Ethics: Convey and practice social, environmental and biological ethics
PO7	To get knowledge about research tools and learn to do review literature. Ability to carry out independent literature survey corresponding to the specific publications type and asses basic research tool
PROGRAM SPECIFIC OUTCOME	
PSO1	Graduates will exhibit contemporary knowledge in Biotechnology and students will be eligible for doing jobs in pharmaceutical and biotechnological Industry.
PSO2	An expert in biotechnology and allied fields (medical, microbial, Agricultural, environmental, plant and animal) for utilizing the practical skill to address biotechnological challenges.
PSO3	Graduates will be able to work individually as well as in team to survive in multidisciplinary environment.
PSO4	If students will engage themselves in the process of effective learning, it will give opportunities to utilize acquired knowledge for the catering the needs of science and technology as well as for the betterment of human mankind.
PSO5	Graduates will be able to understand the potentials, and impact of biotechnological innovations on environment and their implementation for finding sustainable solution to issues pertaining to environment, health sector, agriculture, etc.
PROGRAM EDUCATIONAL OBJECTIVES	
PEO1	To obtain detailed information about the fundamentals of Biotechnology, allied subjects and life skills
PEO2	To provide information about the molecular methods which involved in cellular processes of living systems such as microbes to higher order organisms for applied aspects. To address the emerging need for skilled scientific manpower with research ethics involving organisms
PEO3	To impart the basics and current molecular tools in the areas of Molecular Diagnostics,

	Fermentation Technology, Plant, Animal & Environmental Biotechnology are included to train the students for man power development and also sensitize them to scope for research. The practical subjects will provide information about the careers in the industry and applied research where biological system is employed
PEO4	To make the graduates of Biotechnology to learn and to adopt in a competitive world of technology update and contribute to all forms of life
PEO5	To enable them to excute a research objective through experimentation

POs/PEO	PO1	PO2	PO3	PO4	PO5
PEO1	*	*		*	
PEO2			*	*	*
PEO3		*		*	
PEO4	*	*			*
PEO5			*		

Course Code	Course Title	L	T	P	C
SEMESTER I					
20217SEC11	General Microbiology	6	1	0	5
20217SEC12	Molecular Genetics	6	1	0	5
20217SEC13	Biochemistry	6	1	0	4
20217SEC14L	Microbiology & Molecular Genetics – Lab	0	0	4	2
20217DSC15_	Discipline specific elective I	5	0	0	4
20217RLS16	Research Led Seminar	-	-	-	1
	Total	23	3	4	21
SEMESTER II					
20217SEC21	Cell & Molecular Biology	5	1	0	5
20217SEC22	Biophysics & Bioinformatics	5	1	0	5
20217SEC23	Industrial Biotechnology	5	0	0	4
20217SEC24L	Molecular Biology & Industrial Biotechnology – Lab	0	0	4	2
20217DSC25_	Discipline specific elective II	5	0	0	4
20217RMC26	Research Methodology	3	0	0	2
20217BRC27	Participation in Bounded Research	-	-	-	2
	Total	23	2	4	24

SEMESTER III					
20217SEC31	Genomics	6	1	0	6
20217SEC32	Proteomics	6	1	0	6
20217SEC33L	Genomics & Proteomics - Lab	0	0	5	3
20217DSC34_	Discipline specific elective III	5	0	0	4
202_OEC	Open Elective	4	0	0	3
20217SRC35	Design\socio technical research	-	-	-	2
	Total	21	2	5	24
SEMESTER IV					
20217SEC41	Food Technology	6	1	0	6
20217SEC42	Bio instrumentation	6	1	0	6
20217SEC43L	Food technology and Bio instrumentation lab	0	0	5	3
20217DSC44	Discipline specific elective IV	5	0	0	4

20217PRW45	Project work	-	-	-	6
20217PEE	Programme Exit Examination	-	-	-	2
	Total	17	2	5	27
	Total Credits for the Programme				96

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a)20217DSC15A- Immunology b)20217DSC15B- Biosafety and biodiversity
	Discipline specific Elective Courses-II
II	a)20217 DSC25A- Endocrinology b)20217 DSC25B- Bioethics and IPR
	Discipline specific Elective Courses-III
III	a)20217 DSC34A- Nanobiotechnology b)20217 DSC34B- Environmental biotechnology

IV	Discipline specific Elective Courses-IV
	a)20217 DSC44A-Gene therapy utilization pharmacology b)20217 DSC44B- Plant conservation & disaster management

Open Electives

Semester	Open Elective Courses
III	a) 202ENOEC-Writing for the media b) 202MAOEC-Applicable Mathematics Techniques c) 202PHOEC-Bio-Medical Instrumentation d) 202CHOEC-Green Chemistry e) 202CSOEC – M-Marketing f) 202CMOEC- Financial Services

Credit Distribution:

Sem	SEC	DSC	OEC	RSB Courses	Others	Total
I	16	4	-	1	-	21
II	16	4	-	4	-	24
III	15	4	3	2	-	24
IV	15	4	-	6	2	27
Total	62	16	3	13	2	96

SEMESTER I

Course Code	GENERAL MICROBIOLOGY	L	T	P	C
20217AEC11		6	1	0	5

AIM:

- This paper provides the knowledge about different types of microorganisms and their identification techniques in modern biology and there by the usefulness of the techniques in research and commercial purposes.

OBJECTIVES:

- In order to make the students to understand the identification of microorganisms using advanced microbiological methods and applications of microorganisms.

OUTCOMES:

- Students can gain the idea of how to identify the microorganisms based on the modern polyphasic approach.

Unit I

Definition and historical account of microbiology. Diversified microbial world-Classification of microbes based on Whittaker's five kingdom system of classification. Structure of Algae, Bacteria, Fungi and Virus.

Unit II

Nutritional requirements and growth cycles of the above mentioned groups. Media for growth: Types, preparation, methods of sterilization. Isolation and enumeration of microorganisms in soli, water and air. Isolation of microorganisms from contaminated food. Techniques of pure culture, maintenance and preservation; staining: stains and dyes, types of staining; General techniques involved in Virology and Protozoology.

Unit III

Microbial physiology: Factors influencing the growth of microbes-classification based on the temperature, pH, nutrition, symbiotic associations, commonsals, saprophytes, etc., Microbiology of fermented foods-dairy products, meat and fish, alcoholic beverages-beer, wine etc., Food spoilage and preservation process. Microbes as source of food. Application of microbes in industries production of antibiotics, amino acids,

organicacids, bioconversion process, microbial insecticides.

Unit IV

Biochemistry of Metabolism: Carbohydrates and energy metabolism – fermentation and glycolysis, TCA cycle and oxidative phosphorylation, ammonia metabolism. Biosynthesis of glutamate. Purine and pyrimidine biosynthesis. Synthesis of DNA and RNA. Biosynthesis of cell wall – Peptidoglycan and Teichoic acid.

Unit V

Microbes as components of the environment – nutrient cycles – C, N, S, H, O, Mn, K, Mg, Cl and phosphorus cycles, Degradation of industrial wastes, petroleum hydrocarbons, pesticides, biofouling and corrosion. Bacterial photosynthesis, symbiotic and non-symbiotic nitrogen fixation, antimicrobial agents – structure of antibiotics, antibacterial and antiviral (function & mechanism of action)

Book references:

- Fundamental Principles of Bacteriology – A.J. Salle
- Microbiology – Michael J. Pelchar, E.C.S. Chan Noel R. Krieg.
- Microbial Physiology – Albert G. Moat and John W. Foster – Willey – Interscience Publication
- Food Microbiology – W.C. Frazier and D.C. Westhoff, Tata Mcgrah Hill Publication
- Microbial Biotechnology – Alexander N. Glazer, Hiroshni-Kaido, W.H. Freeman and Co. 1995.
- Chemical Microbiology – Antony H. Rose, Butterworths, 3rd Edition, Plenum Press, 1976.

Course Code	Molecular genetics	L	T	P	C
20217AEC12		6	1	0	5

AIM:

- This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

OBJECTIVE:

- The major objective of the paper is to envisage thorough knowledge in genetics and genome organizations in organisms.

OUTCOME:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

Unit I

Gene as the unit of mutation and recombination. Identification of DNA as the genetic material. Mutations: Molecular nature, mutagenesis by nitrous acid, hydroxylamine, alkylating agents, intercalators and UV, origin of spontaneous mutations and control, parasexual process in bacteria, transformation, transduction and conjugal gene transfer the phenomena, mechanisms and applications. Fine structure genetic analysis with examples.

Unit II

Recombinations – Control, models and mechanisms. Gene as the unit of expression. Gene – cistron relationship in prokaryotes and eukaryotes. Colinearity of gene and polypeptide. Elucidation of the genetic code. Wobble base pairing. Suppression of nonsense, missense and frameshift mutations. Regulation of gene expression in prokaryotes and eukaryotes. The operon concept – positive and negative control, attenuation control. Control sequences, promoter, operator, terminator and attenuator, DNA methylation and epigenic regulation.

Unit III

DNA damage and repair DNA damage by UV, alkylating agents, cross linkers. Mechanisms of repair – photoactivation, excision repair, recombinational repair. The SOS and adoptive responses and their regulation, heat shock response.

Unit IV

Extrachromosomal heredity, Biology of plasmids – discovery, types and structure of RTF, col-factors and Ti. Replication and partitioning. Incompatibility and copy number control. Natural and artificial plasmid transfer and their applications. Transposable genetic elements: discovery, early experiments of McClintock in maize. Insertion sequences in prokaryotes. Complex transposons – Tn 10, Tn 5, Tn 9 and Tn 3 as examples. Mechanisms control, consequences and applications of transposition by simple and complex elements. Retro elements.

Unit V

Genetics of Eukaryotes: Gene linkage and chromosome mapping, crossing over, three point cross, tetrad analysis. Complementation. Organization of chromosomes, specialized chromosomes. Chromosome abnormalities, quantitative inheritance, population genetics. Developmental genetics using *Drosophila* as model system. Somatic cell genetics.

Reference Books:

- Microbial Genetics – S.R. Maloy, J.E. Cronan and D. Friefelde 1994. Jones and Barlett Publishers.
- Molecular Genetics of Bacteria – J.W. Dale 1994 John Willey and Sons.
- Concepts of Genetics – W.S. Klug and M.R. Cummings Prentice Hall, 1997.
- Introduction of Genetic Analysis of Griffiths – Freeman Co., 1996.
- Advanced Molecular Biology of the Gene – Watson J.D. Hopkins NH, Roberts, J.W. Steitz. J.A.

Course Code	BIOCHEMISTRY	L	T	P	C
20217SEC13		6	1	0	4

AIM:

- This paper presents the study of identification and quantitative determination of the substances, studies of their structure, determining how they are synthesized metabolized and degraded in organisms, and elucidating their role in the operation of the organism.

OBJECTIVE:

- On the successful completion of the course the students will get an overall understanding of structure of atoms, molecules and chemical bonds, enzyme kinetics, bio polymers and metabolic reactions in a living system.

OUTCOME:

- This paper in biochemistry has been designed to provide the student with a firm foundation in the biochemical aspects of cellular functions which forms a base for their future research.

Unit I

Principles of Bioenergetics. Glycolysis and carbolism of hexoses the citric acid cycle.Oxidation of fatty acids. Oxidation of amino acids. Oxidative phosphorylation.Glyoxylate cycle, TCA cycle, Kreb cycle, Pentose Phosphate pathway. Nitrogen cycle.

Unit II

Carbohydrate – types, structure and functions of carbohydrates,biosynthesis, lipidbiosynthesis, C2, C3, C4 cycles. Biosynthesis of fatty acids and triacyl glycerol.Secondary metabolites – occurrence, classification and functions of phenolics, terpenes,flavonoids, alkaloids, saponins, glycosides.Applications of secondary metabolites in food, dairy, agricultural, cosmetics and pharmaceutical Industries.

Unit II

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity,Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens.

Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

Unit III

Biosynthesis of amino acids, nucleotides and related molecules. Classification of proteins based on functions and solubility, types of proteins structure and functions. Chemical synthesis of peptides and oligosaccharides. A general account of secondary metabolic pathway.

Unit IV

Integration and hormonal regulation of mammalian metabolism. Biological membrane and transport. Enzymes classification, mechanism, factors affecting enzyme action Vitamins and minerals.

Unit V

Lipids classification, importance, fatty acids, essential non essential fatty acids. Prostaglandins, leukotrienes, thromboxanes, interferons and interleukins. Antibiotics, cytoskeletal organization, ribozymes.

Book references:

- Principles of Biochemistry – A.L. Lehninger, D.L., Nelson and MM Cox 1993 Wokrth Publishers, New York.
- Biochemistry – L. Styler 1994 Freeman & Co New York. .
- Biochemistry – G. Zubay 1988 macmillan Publishing Co New York and Business

Course Code	MICROBIOLOGY & MOLECULAR	L	T	P	C
20217SEC14L	GENETICS LAB	0	0	4	2

- AIM: This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

OBJECTIVE:

- The major objective of the paper is to envisage thorough knowledge in genetics and genome organizations in organisms.

OUTCOME:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

1. Culture media preparation liquid and solid media.

2. Selective differential media

3. Methods of sterilization and testing of sterility

4. Enumeration of bacteria, fungi and actinomycetes from soil

5. Pure culture techniques – Pour, spread and looping methods

6. Maintenance and preservation of cultures

7. Staining of Bacteria – gram, spore and AFB, Fungal wet mount – LPB

8. Motility test – hanging drop and soft agar inoculation

9. Water quality test – MPN

10. Effect of different parameters on bacterial growth kinetics (Substrate, pH,

Temperature)

11. Single colony – isolation and checking for genetic markers, measurements of growth rate one step growth curve using T7 phage.

12. Induced mutagenesis and isolation of antibiotic resistant and auxotrophic mutants

enrichment methods for auxotrophic and antibiotic resistant mutants.

13. Genetic mapping by p1 transduction, genetic mapping of conjugation and transformation.

14. Transposon mutagenesis of chromosomal DNA, Transposon mutagenesis of plasmid DNA

15. Experiments with gene fusion.

Book references:

1) Sadasivam, S. and Manickam A. Biochemical Methods, 2nd Edition, New age International Private Ltd. Publishers.

2) Laboratory Techniques in Biochemistry and Molecular Biology.

3) A short Course in Bacterial Genetics – J.H. Miller 1992, Cold Spring Harbour Laboratory.

4) Methods for Genetics and Molecular Bacteriology – RGF Murray, W.A. Wood & N.B. Krig 1994 American Society for Microbiology.

Course Code	DISCIPLINE SPECIFIC ELECTIVE I	L	T	P	C
20217DSC15A	Immunology	5	0	0	4

AIM:

- Understanding the immune system, antigen antibody reactions, applications of immunological techniques, humoral and cell mediated immunity, hypersensitivity reactions and hybridoma technology.

OBJECTIVE:

- To expose the students with various immune systems of human body.

OUTCOME:

- This course will provide the student insights into the various aspects of Immunology such as classical immunology, clinical immunology, Immunotherapy and diagnostic immunology.

Unit I

Molecular cells & organs of Immune system, Historical perspective, Innate Immunity:-Skin, Mucosal Surface, Physiological barrier, Inflammation, Adaptive Immunity, Molecules of innate & Acquired immune system:- Complement, Interferon, other molecules Cells of Innate & Acquired Immune system. Organs of the immune system:-Primary Lymphoid organs, Secondary Lymphoid organs, Lymphatic etc.

Unit II

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity, Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens. Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

Unit IV

MHC & Transplantation Immunology - MHC:- General organization, MHC molecules & genes, Cell recognition of self & nonself, MHC restriction, Tolerance:- Central Peripheral & acquired tolerance. HLA typing methods using serological and molecular techniques.

Unit V

The Immune system in Health & Disease, AIDS & other Immunodeficiencies, Autoimmunity &

autoimmune diseases. Hypersensitivity, Vaccines:- Principle & types of vaccines, Recent advances in vaccination, Monoclonal & Recombinant antibodies. Immunological techniques: RIA, ELISA, Immunocytochemistry, Immunoblotting, Fluorescence antibody techniques.

- **Book references:**

- Immunology – An Introduction, Tizard R. Jan, 1995 Immunology – Roitt Ivan, Jonathan Brastoff, David Male, 1993.
- Immunology – Janis Kubey, 3rd Edition.
- Text Book of Microbiology – Anathanarayanan R and Jayaraman Panikar, 1996.
- Immunology – Weir D.M. and Steward, J. 1997. 8th Edition Churchill Livingston

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Course Code	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	C
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AIM:

- This course has been designed to provide the student insights into these invaluable areas of biotechnology, which play a crucial role in determining its future use and applications.

OBJECTIVE:

- Students get an idea about the advantages and disadvantages of biotechnological applications, ethical implications, and intellectual property rights.

OUTCOME:

- To study the diversity of plants and animal life in a particular habitat, ethical issues and potential of biotechnology for the benefit of man kind

Unit 1:

Introduction and historical background. Introduction to biological safety cabinets, primary containment for biohazards, biosafety levels, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals. Biosafety guidelines by Government of India. Definition of GMOs and LMOs.

Unit 2:

Environmental release of GMOs, risk assessment; risk management and communication. Overview of national regulations and relevant international agreements including Cartagena protocol.

UNIT 3 :

Biodiversity – Concept and Definition Scope a**Unit II**

Antigens, Antibody & Ag-Ab Interaction - Antigens: - Immunogenicity vs Antigenicity, Factors influencing Immunogenicity, Adjuvant, Epitopes & Haptens, super antigens, autoantigens. Antibody:- Structure, classes & functions, Allotypes & Idiotypes. Basic principles of Antigen-Antibody Interaction. Immunological techniques: Principles & Applications: Precipitation & agglutination, Radio. Immunoassay, Enzyme linked Immunosorbent Assay etc.

Unit III

Mechanism of Immune response, Generation of Immunological diversity, Antigen recognition, Lymphocyte development & activation, Lymphocyte interaction, cytokines & lymphoid system.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Constraints of Biodiversity Science, Composition and Scales of Biodiversity: Genetic Diversity, Species/ Organismal Diversity, Ecological/ Ecosystem Diversity, Landscape/ Pattern Diversity,

Agrobiodiversity, Biocultural Diversity and Urban Biodiversity.

UNIT 4 :

Values of biodiversity Instrumental/Utilitarian value and their categories, Direct use value; Indirect/ Non-consumptive use value, Introduction to Ecological Economics; Monetizing the value of Biodiversity; Intrinsic Value; Ethical and aesthetic values, Anthropocentrism, Biocentrism, Ecocentrism and Religions; Intellectual Value; Deep Ecology.

UNIT 5 :

Threats to biodiversity Habitat Destruction, Fragmentation, Transformation, Degradation and Loss: Causes, Patterns and consequences on the Biodiversity of Major Land and Aquatic Systems Invasive Species' pathways, biological impacts on terrestrial and aquatic systems.

Extinction: Types of Extinctions, Processes responsible for Species Extinction, Current and Future Extinction Rates, IUCN Threatened Categories, Sixth Extinction/Biological Crisis.

REFERENCES

- Groom MJ, Meffe GR and CR Carroll, (2006). Principles of Conservation Biology. Sinauer Associates, Inc., USA
- Krishnamurthy KV, (2003). Textbook of Biodiversity. Science Publication
- Primack R, (2014). Essentials of Conservation Biology. Sinauer Associates,
- Hambler C and SM Canny, (2013). Conservation. Cambridge University Press.
- Van Dyke F, (2008). Conservation Biology Foundations, Concepts, Applications 2nd Edition,

Course Code	CELL & MOLECULAR BIOLOGY	L	T	P	C
20217AEC21		5	1	0	5

AIM:

- This paper provides a thorough knowledge about structure and function of cells, cellular energetics, protein trafficking, bio molecules and cellular development.

OBJECTIVE:

- Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

OUTCOME:

- Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields.

UNIT-I:

Cell architecture: Structure of cells – structure of prokaryotic and eukaryotic cells; Surface appendages – Cilia and Flagella, Capsules, Pili, Fimbriae and slime layers; Cell walls – Algae, fungi, bacteria ; Membranes of Gram positive, Gram negative bacteria and acid fast bacteria; protoplast, spheroplast and endospores; Transport across membrane – active and passive transport, transport channels and pumps, transport across nuclear membrane; Neurotransmission, neuromuscular junction.

UNIT-II:

Cellular constituents: Cytoskeleton and structural components – Microfilaments, Intermediate filaments, Microtubules; Mitochondria – structure, biogenesis; Chloroplast – structure, biogenesis; Endoplasmic reticulum and Golgi complex – structure, function, vesicular transport and import into cell organelles; Structure and function of ribosomes, mesosomes, lysosomes, peroxysomes.

UNIT-III:

Nucleus: Nucleus structure – structural organization, nucleosome, supranucleosomal structures, specialized chromosomes, polytene and lamp brush chromosomes and chromosome banding; Nucleic acid structure: DNA and RNA.

UNIT-IV:

Cell cycle: Mechanism of cell division – Mitosis, meiosis and genetic recombination; regulation of cell cycle – factors and genes regulating cell cycle (Cyclins, CDK and CDKI). Biochemistry and molecular biology of Cancer – malignant growth, tumour suppressor genes (p53, RB) and oncogenes (Ras), chemical carcinogenesis, hormonal imbalances.

UNIT-V:

Cellular development: Extracellular matrix – cell to cell and cell-matrix adhesion, cell junctions; Cellular systematic – components of systematic, receptors (cell surface – GPCR, RTK, TGF- β , Hedgehog, Wnt, Notch-Delta, NF-K β , ion channels; intracellular – NO, Nuclear receptor), secondary messengers, effectors ; cell differentiation; gametogenesis and fertilization; development of Drosophila and Arabidopsis – spatial and temporal regulation of gene expression.

REFERENCES

- Introduction to genetics: A molecular approach, T.A. Brown, Garland Science, 2011.
- Molecular Biology of the Gene (7th Edition, J.D.Watson, Tania A. Baker, Stephen P. Bell
- Michael Levine, Richard Losick) Benjamin/Cummings Publ. Co., Inc., California, 2013
- Genes XI (9th Edition) Benjamin Lewin, Jones & Bartlett Learning, 2008
- Molecular biology and Biotechnology. A comprehensive desk reference, R.A. Meyers (Ed) Wiley-Blackwell Publishers, 1995

Course Code	BIOPHYSICS & BIO INFORMATICS	L	T	P	C
20217AEC22		5	1	0	5

AIM:

- Biology is fast becoming an interdisciplinary science. There is accumulation of large amount of information in different areas of biology - on genome sequences of many organisms, genetic and biochemical interaction networks, cell interactions during development, and organism response to environmental stimuli, along with molecular understanding of diseases. This has led to the

emerging need for a holistic description of the working of biological systems at different scales.

OBJECTIVES:

- To gain an appreciation for the field of systems biology. To understand and learn the technical details of several current experiments or technologies used in the field of systems biology. To understand some of the larger questions and issues with systems biology and large-scale data collection and analysis.

OUTCOMES:

- This paper has been designed to give the students comprehensive training in the emerging and exciting upcoming field of Systems Biology, which will help students to get career in both Industry/R&D.

UNIT-1

Physics and biology: scope and methods of biophysics. Levels of molecular organization. Association of macromolecules, lipids in biological membranes. Protein in biological membranes. Molecular machines and dynamics.

UNIT-II

Understanding structures of proteins at different levels.- primary, secondary, tertiary and quaternary: conformational analysis and forces. Understanding structures of nucleic acids at different levels- primary, secondary, tertiary and quaternary: conformational analysis of interactions- polysaccharides

UNIT-III

Introduction to Bioinformatics-scope and application characteristics of hardware and software. Types of computer, Bio-chips, computer network sending and receiving e-mail. Internet browsing- searching biological articles information in internet.

UNIT-IV

Computer applications in biology- uses of databases in biology- analysis of proteins and nucleic acid sequence- molecular modeling- introduction to data processing- files- data collection- preparation-editing- backup- file recovery-procedure-sorting-searching and merging.

UNIT-V

Biomolecules- carbohydrate, protein, lipids and nucleic acids, protein conformation-prediction of protein structure-fold recognition, comparative modeling (homology)-basic principles of X-ray diffraction studies, NMR, Mass spectroscopy in identifying protein information.

Reference books:

- Introduction to protein structure by C. Branden and J. Tooze(1991) Garland publishing company

- Biochemistry by L.Stryer. (1995) WH freeman and co.
- Biophysical chemistry part-I& III by cantor amd schimmel(1980) WH freeman and co.
- Biophysics and bio physical chemistry by debajyoti Das (1987) academic press.
- Molecular databases for protein sequence and structure studies by sillinee. JA and sillince .M (1991) spring verlag.
- Sequence analysis primer by M. Gribskov, J.Dvvereux()1989 stockton press.

Course Code	INDUSTRIAL BIOTECHNOLOGY	L	T	P	C
20217AEC23		5	0	0	4

AIM:

- To understand the, environmental pollution and remediation using Biotechnology and its control.

OBJECTIVE:

- Students will get an idea about the hazards to our environment, solutions to protect it and for sustainable development.

OUTCOMES:

- This course is important in the era of industrialization leading to environmental hazards and hence will help students to take up a career in tackling industrial pollution and also to take up the research in areas like development of biological systems for remediation of contaminated environments (land, air, water), and for environment-friendly processes such as green manufacturing technologies and sustainable development.

UNIT-I

Industrial microbiology an introduction- modern fermentation process and biochemical engineering- isolation, screening and strain improvement of microorganisms.

UNIT-II

Media design and sterilization for fermentation processes- media requirements for fermentation processes- examples of simple and complex media. Design and usage of commercial media for industrial fermentations- batch and continuous fermentations system- sterilization system of liquid media and air.

UNIT-III

Basic principles of bioprocess-media formulation- fermentation equipment and its use- type of fermentor (Batch and continuous fermentor) and its application. Tray, CSTR, BCF, HFMB, RBC and inner and outer loop.

UNIT-IV

Traditional industrial process – anaerobic process ethanol, lactic acid, acetone- butanol production)- aerobic process (citric acid baker’s yeast penicillin production).

UNIT-V

Medical application of bioprocess engineering- commercial tissue culture process- gene therapy using viral vectors- models of viral infections- mass production of retrovirus. Advanced biological

waste water treatment applications

EMPLOYABILITY / ENTREPRENEURSHIP/ SKILL DEVELOPMENT

REFERENCES:

- Industrial microbiology by J.H patel
- Industrial microbiology by G.H casida

Course Code	MOLECULAR BIOLOGY & INDUSTRIAL BIOTECHNOLOGY lab	L	T	P	C
20217SEC24L		0	0	4	2

AIM:

This paper provides a thorough knowledge about structure and function of cells, cellular energetics, protein trafficking, bio molecules and cellular development.

OBJECTIVE:

Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

OUTCOME:

Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields

- Living cells preparation by histochemical techniques
- Microtomy
- Squash preparation of onion root tip
- Production of enzyme (amylase)
- Immobilization of cells and enzymes by calcium alginate method
- Effect of different parameters on bacterial growth kinetics (ph, temperature)
- Production of organic acid
- Immunocytochemical analysis for specific cellular constituents
- Cytochemical study of cells/ cell types using specific dyes reagents
- Estimation of protein and carbohydrates
- Alcoholic fermentation of fruit juice by yeast (*Saccharomyces cerevisiae*)
- Separation of amino acid by paper chromatograph.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

REFERENCE:

- Sadasivam.S and Manickam.A biochemical methods H Edition. New Age nternational PVT. Publishers.
- Boyer R. Modern experimental biochemistry, III edition, Benjamin cummings publishers.

Course Code	3883	L	T	P	C
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AIM:

This is a comprehensive study of the endocrine system which will allow the student to integrate and better understand the functions of the other systems of the body. The relationship of the nervous system to the endocrine system is explored in the context of signaling within a multicellular organism..

OBJECTIVE:

- To have a basic understanding of the endocrine system.

OUTCOMES:

- To know the pathophysiological significance of the system with special reference to humans.

UNIT-I

Hormones in general- definition- types of secretions- nature-classification, synthesis and their role- feedback control with specific examples hormone action proteins and steroids- cell signaling in hormone action

UNIT-II

Hypothalamo hypo physical axis – hormones of hypothalamus and their role structure of pituitary –secretions-physiological role- pathophysiology current status of pituitary as a master gland.

UNIT-III

Thyroid- parathyroid – structure- hormones- synthesis-storage-release-carrier proteins(eb. TBA&TBG)-physiological role-pathophysiology.

UNIT-IV

Adrenal and gonadal hormones- steroid biosynthesis- maintenance of cyclicity physiological role- pathophysiology- steroids in metabolism

UNIT-V

Gastro intestinal hormones-pancreas as an endocrine organ- secretions- functions-physiological role and pathophysiology other endocrine organs in vertebrates insect and crustacean hormones- their role in growth and metamorphosis.

REFERENCE:

- Text book of endocrinology-williams
- Physiological review of biochemistry-harper and others

Course Code	DISCIPLINE SPECIFIC ELECTIVE II	L	T	P	C
20217DSC25B	BIOETHICS AND IPR	5	0	0	4

AIM:

To acquire to acquire specialized knowledge of law and practice relating to Insurance.

OBJECTIVE:

- The aim of this paper is to introduce the basic concepts of Intellectual property laws to the students for first time and familiarize them with the kind of rights, remedies and licensing regime associated with each kind of intellectual property so that students can have a basic understanding of Intellectual Property laws.

OUTCOME:

- To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR’

Unit 1: Overview of Intellectual Property

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

Unit2: Patents

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit 3: Copyrights

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic

works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Unit 4: Trademarks

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

Unit 5: Other forms of IP

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI): Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection Plant Variety Protection

Plant variety protection: meaning and benefit sharing and farmers’ rights – Procedure for registration, effect of registration and term of protection Layout Design Protection

Layout Design protection: meaning – Procedure for registration, effect of registration and term of protection

.Reference book:

- V K Ahuja; Law relating to Intellectual Property Rights; Lexis Nexis, 2017 Reference
- **Journal:** 1. Journal of Intellectual Property Rights (JIPR); NISCAIR
- **Text book:** 1. Neeraj Pandey and Khusdeep Dharni; Intellectual Property Rights; PHI learning Pvt.Ltd., India 2014

Course Code		L	T	P	C
20217RMC26	RESEARCH METHODOLOGY	3	0	0	2

AIM:

- This course introduces and discusses approaches, strategies, and data collection methods relating to research in social sciences. Students will consider how to select the appropriate methodology for use in a study to be performed.

OBJECTIVE:

- This course aims to guide Master One students at the Section of English in the university of Biskra towards achieving competence and proficiency in the theory of and practice to research. This fundamental objective can be realised through helping these students to develop the subject of their research, encourage the formation of higher level of trained intellectual ability, critical analysis, rigour, and independence of thought, foster individual judgement, and skill in the application of research theory and methods, and develop skills required in writing research proposals, reports, and dissertation

OUTCOME:

- To culminate this final stage, students will learn to write a comprehensive research proposal that may be conducted in the future.

Unit I – Research

Selection of problem-stages in the execution of research: choosing a topic to publication- preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, Bibliography. Journal; standard of research journals – Impact factor.

Unit II: Statistical method

Measures of dispersion: Universe and population – delimiting population – sampling method – random sampling, stratified random sampling – types of variables: qualitative and quantitative variables – continuous and discontinuous variables – scaling method S- mean – standard deviation – standard error – coefficient of variation.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Unit III

Coparision of means, chisquard test, student test (ANOVA ‘portioning of variation). F test – model sums on one way ANOVA with interpretation of data – introduction to MANIVA – Statistical and their use – significance test and fixing levels of significance – use of statistical software like COSTAT and STATISTICA. Breif introduction to pie and histograms. Use of LCD.

UNIT IV:

Chromatography – priniciple, operative technique and applications of paper, TLC, adsorption chromatography, GLC and HPLC. Ion-Exchange, molecular sieve, Electrophoretic techniques – principle and technique of gel, SDS, high voltage and discontinuous electrophoresis, isoelectric focusing, plused field gel electrophoresis and capillary electrophoresis. Spectrometry –

Centrifugation techniques.

UNIT V:

Unit2: Patents

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit 3: Copyrights

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure. X-Rays – X-Ray diffraction, crystals and detectors, quantitative analysis and applications. Radio chemical methods – Basic concepts, counting methods and applications. Autoradiography, detection and measurement of radioactivity, applications of radioisotopes in biology.

References:-

- An introduction to practical biochemistry by David T. Plummer.
- Laboratory Manual in Biochemistry by Pattabiraman and Acharya
- Practical Biochemistry by J. Jayaraman.
- Analytical Biochemistry, D. J. Homie and Hazel Peck, Longman group, 3rd edition, 1998.
- Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2nd Edition 1999.
- Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3rd 1999.
- Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2nd edition, Pp 160, ISBN: 081208005
- Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plagrave Macmillan, Pp256. ISBN 1403905843

Course Code	GENOMICS	L	T	P	C
20217AEC31		6	1	0	6

AIM:

- To study prokaryotic and eukaryotic genomes, general methods of genome sequencing techniques, genome analysis and annotations, genome mapping techniques and applications of genomics.

OBJECTIVE:

- Explain the aspects of genome organisation, analysis and applications.
- Provide the details of prokaryotic and eukaryotic genome.

OUTCOME:

- Acquire the aspects of Gene Contig and Shotgun method.
- Know the features of the Genome Mapping databases.

UNIT -I INTRODUCTION: Genome structure and anatomy of prokaryotic and eukaryotic genome – Nuclear genomes – Organelle genomes – Repetitive DNA sequence – Transposable elements– Pseudo genes – Genome databases – organisms-specific databases.

UNIT -II GENOME SEQUENCING DNA sequencing techniques: Maxam Gilbert method – Sanger’s method – Pyrosequencing – Whole genome sequencing – Gene Contig and Shotgun method – Human genome project.

UNIT -III GENOME ANALYSIS AND ANNOTATION: Searching and locating Genes – Programs and databases – Determining function of genes – Gene Prediction – Methods of gene prediction – Softwares and tools.

UNIT -IV GENOME MAPPING: Mapping databases – Types of mapping – Genetic mapping: DNA markers – RFLP, SSLP, RH maps, SNP – Linkage analysis – Physical mapping: Restriction mapping – FISH – STS mapping

UNIT -V APPLICATIONS OF GENOMICS DNA: microarray and its applications – Medical applications: Development of Antibiotics – Vaccines – Drug discovery – Human genetics diseases: Identification – Gene Diagnosis and Gene therapy– Genomics in Plant Biology.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

MATERIALS FOR STUDY AND REFERENCE:

- Brown T.A., Genomes 3 (3rd Edn.), Garland Science Publishing, New York, 2007.
- Brown T.A., Gene Cloning and DNA Analysis – An Introduction (6th Edn.), A John Wiley & Sons, Ltd., Publications, UK, 2010.
- Jeremy W. Dale and Malcolm von Schantz, From Genes to Genomes – Concepts and Applications of DNA Technology, John Wiley & Sons, Ltd., Publications, UK, 2002.
- Richard J. Reece, Analysis of Genes and Genomes, John Wiley & Sons, Ltd., Publications, UK, 2004.

Course Code	PROTEOMICS	L	T	P	C
20217AEC32		6	1	0	6

AIM:

- To understand the proteins enclosed by the genes with respect to structure, function, protein – protein interactions, techniques for separation and analysis, database and applications.

OBJECTIVE:

- Give a detailed description on protein sequencing.
- Provide an overview of proteome databases.

OUTCOME:

- Gain knowledge on phylogenetic profiles
- Describe the features of Yeast two-hybrid system.

UNIT -I INTRODUCTION: Proteomics introduction – Protein sequencing – Protein Digestion Techniques – Mass Spectrometers for Protein and Peptide Analysis – Protein Identification by Peptide Mass Fingerprinting – Software Tools for Peptide Mass Fingerprinting: Finding the Matches – Peptide Sequence Analysis and Protein Identification with Tandem Mass Spectrometry

UNIT -II PROTEOME DATABASES: Proteome databases – Comparative proteomics methods – 2D gel databases – Protein interaction data bases – Metabolic pathway databases – resources for interaction prediction – network and pathway visualization tools – Protein network analysis

UNIT -III PROTEOMICS TOOLS : 2D gel electrophoresis and Mass spectra – Protein identification from 2D gel, mass spectra and sequence data – Protein property prediction – bulk, active sites, modification sites, interactive sites, location, localization, stability, shape, domains properties, secondary and tertiary structures – Protein identification programs – Muscot – PeptIdent – Protein prospector – GFS

UNIT- IV FUNCTIONAL PROTEOMICS Functional proteomics – protein phenotypes – Protein-Protein Interaction Mapping: Experimental – Yeast two-hybrid system – phage display – protein fragment complementation assays – Computational approach

UNIT -IV APPLICATION OF PROTEOMICS: Applications of Proteomics – Protein Expression Profiling – Identifying Protein – Protein Interactions and Protein Complexes – Mapping Protein Modifications – Protein Arrays and Protein Chips – Application of proteomics to medicine, toxicology and pharmaceuticals

UNIT -V Current Contours: (For Continuous Internal Assessment only) Computational Proteomics and Metabolomics- Sequence comparison. – Genome sequencing. – Proteomics. – Phylogeny. – Gene expression - Enzymology

MATERIALS FOR STUDY AND REFERENCE

- Baxevanis D and Ouellette BFF, Bioinformatics: A practical guide to the analysis of genes and proteins (3rd Edn.), John Wiley & Sons, 1995.

- . Baxevanis D and Ouellette BFF, Bioinformatics: A practical guide to the analysis of genes and proteins (2nd Edn.), John Wiley & Sons, Inc. 2002.
- Brown TA, Genomes (2nd Edn.), BIOS Scientific Publishers, Oxford, UK, 2002.
- Sensen CW, Essentials of Genomics and Bioinformatics, Wiley–VCH. 2002.
- Sensen CW, Hand book of Genome Research, Wiley–VCH Verlag GmbH & Co,

Course Code	Genomics & Proteomics - lab	L	T	P	C
20217SEC33L		0	0	5	3

AIM:

- The study of animal cells has helped us gain an insight not only in the structure and function of cells and tissues but also in different physiological, biochemical and immunological processes

OBJECTIVE:

- The major objective is to provide a world-class training experience for these students in an interdisciplinary research program connecting animal genomics with animal reproduction and biotechnology.

OUTCOME:

- This paper will help students interested in careers as laboratory, research or animal care technicians in the fields of veterinary and human health or biotechnology.

• Isolation of DNA from bacteria, fungus, animal tissues.

• Bacterial gene expression.

• Restriction mapping.

• PCR techniques.

• DNA finger printing PFLP, RAPD.

• Human Genome - Wellcome Trust Genome Browser

• FlyBase - A Database of Drosophila Genes & Genomes.

• Tandem repeats finder- A program to analyze DNA sequences

• PeptideCutter - Predicts potential cleavage sites cleaved by proteases or chemicals in a given protein sequence.

• PSORT - Program for the prediction of protein localization sites in c

• PROSITE - Protein Domain, Family & Functional Site Prediction

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT**REFERENCE:**

1. DNA cloning I & II by DM. Glover & BD. Hames(1995) IRL press.

2. PCR strategies by MA.Innis, DH.Gelfand & JJ. Sninsky (1995) academic press.
3. Concepts in biotechnology- editors D.Balasubramanian *et al.* university press,(1996).
4. Genetic engineering in animals. A.Puller(ed). VCH publishers.
5. BioEssays- K.K. Jain MD
6. Mapping of Genomes- Eric D. Green, Sue Klapholk.

Course Code		L	T	P	C
20217DSC34A	DISCIPLINE SPECIFIC ELECTIVE COURSE-III NANOBIOTECHNOLOGY 3893	5	0	0	4

AIM:

- One of major applications of nanoscience is in biotechnology field.

OBJECTIVE:

- nanotechnology attracts students from various disciplines, a single course which starts by sensitizing students from a varied background about the biological/biotechnological basics and culminates into modern day applications of nanoscience in biotechnology

OUTCOME:

- This course will act as a bridge between students from non-biology course at all levels

Unit- I

Basic biology principles and practice of micro fabrication techniques, Atomic force microscopy, biological production of metal nano particles, macro molecular assemblies.

Unit-II

Application in Biomedical and biological research, nano particles, viruses as nano- particles, nano chemicals and application., tumor targeting and other diagnostic application.

Unit-III

Developing drug delivery tools through nano biotechnology, nano particle based immobilization assays, quantum dots technology and its application.

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT**Unit-IV**

Synthesis and characterization of different classes of biomedical polymers their uses in pharmaceutical, cardiovascular ophthalmologic orthopedic areas.

Unit-V

Biosensors and nano biotechnology principles used in construction of microelectronic devices sensors and macro mechanical structures.and their functioning, immunonanotechnology.

Textv Book:

- Nano Biotechnology by Balaji, Subbaih

Reference Books:

- Nanobiotechnology- concepts, applications and perspectives, niemeyer, christofm. Mirkin, chad a. wiley publishers.
- Nanobiotechnology of biomimetic membranes, martin, donald (edt), springer verlag publishers.

Course Code	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	C
20217DSC34B	COURSE-III Environmental biotechnology	5	0	0	4

AIM:

- To understand the energy sources, environmental pollution and remediation using biotechnology and its control.

OBJECTIVE:

- Students will get an idea about the hazards to our environment, solutions to protect and for sustainable development.

OUTCOME:

- This course is important in the era of industrialization leading to environmental hazards and hence will help students to take up a career in tackling industrial pollution and also who is willing to take up the research in areas like development of biological systems for remediation of contaminated environments (land, air, water), and for environment- friendly processes such as green manufacturing technologies and sustainable development

Unit I

Introduction, Importance and Scope of Environment Biotechnology. Renewable and Non-Renewable Resources of Energy. Conventional fuels and their impact on Environment – Firewood, Animal wastes, Coal, Petroleum and Animal oils.

Unit II

Modern fuels and their impact on environment – Methanogenic Bacteria, Biogas Production, Microbial Hydrogen Production, Conversion of Sugar to Alcohol, Gasohol. Effect of Green Revolution and Industrial Revolution on Environment.

Unit III

Waste Water Pollution (Sewage) Treatment Process - Septic tank, Mechanical and Biological Treatment, Trickling Filters, Activated Sludge Process, Oxidation Ponds, Anaerobic Sludge Digestion. Solid Waste Disposal- Sanitary Landfills, Composting, Vermicompost

Unit IV

Biofertilizers- Definition, Distinguished Features of Biofertilizers and Organic Manures. Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM).

Unit V

Bioleaching- Ore Leaching and Role of Microbes in Mines (copper, and Uranium). Environmental significance of Genetically modified microbes, plants and animals. Bio- assessment of environmental quality.

EMPLOYABILITY / ENTREPRENEURSHIP /SKILL DEVELOPMENT

Text Book:

- Fundamental of Environmental Studies by Bharrgava, D.S

Reference Books:

- John E Smith – Biotechnology, Cambridge University Press
- Prescott & Dunn - Industrial Microbiology, AVI publishing Co. USA
- Mukerji, Singh & Garg - Frontiers in applied Microbiology, Prink House India, Lucknow
Pepler & Perlman – Microbial Technology, Academic Presss, New York
- Nicholas C Price – Fundamentals of Enzymology Chaplin & Bueke – Enzyme technology
- Moses and Capes – Biotechnology- the Science and Business

Course Code	Course Title	L	T	P	C
202ENOEC	Open Elective -Writing for the Media	4	0	0	2

Aim:

- To equip students to enter the realm of mass media.

Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop- Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

References-

Journalism	-Susan
Professional Journalism	-John Hogenberg
News Writing and Reporting	-M.James Neal (Surjeet Publication)
Professional Journalism	-M.V Komath
The Journalist's Handbook	-M.V Komath
Mass Communication & Journalism	-D.S Mehta,

Course Code	Course Title	L	T	P	C
202MAOEC	Open Elective – Applicable Mathematical Techniques	4	0	0	2

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
202PHOEC	Open elective Biomedical Instrumentation	4	0	0	2

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

Outcomes:

- To familiarize students with various medical equipments and their technical aspects
- To introduce students to the measurements involved in some medical equipment.
- Ability to understand diagnosis and therapy related equipments
- Understanding the problem and ability to identify the necessity of an equipment to a specific problem

UNIT – I: Bio Electric Signals And Electrodes

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: Recording System And Recorders

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: Measurement And Analysis Techniques

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: Magnetic Resonance And Ultrasonic Imaging Systems

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – medical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: Advanced Bio Medical Systems

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
202CHOEC	Open Elective-Green Chemistry	4	0	0	2

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
 - To know about the Pollution and its prevention measures.
 - To familiarize the green chemistry.
 - To learn about the bio-catalytic reactions.
 - To understand about the vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO₂ - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
202CSOEC	Open Elective-M- Marketing	4	0	0	2

Aim :

- To provide the conceptual and technological developments in the field of internet and web designing with the emphasis on comprehensive knowledge of internet.

Objectives:

- To understand the web designing and web development with the knowledge of internet.
- To learn the overview of the design of HTML & Scripting Languages.
- To learn the use of website and internet design and development.

Outcomes:

- Acquire knowledge about functionalities of Internet
- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet. Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall

UNIT II

Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Servers, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.

UNIT III

Email Networks and Servers, Email protocols –SMTP, POP3, IMAP4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.

UNIT IV

HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames,

HTML Images, multimedia - ASP, VB Script, JAVA Script, JAVA and Front Page, Flash

UNIT V

Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptograms.

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

References

1. Greenlaw R and Hepp E “Fundamentals of Internet and www” 2nd EL, Tata McGrawHill,2007.
2. Ivan Bayross, “HTML, DHTML, JavaScript, Perl CGI”, 3rd Edition, BPB Publications.
3. D. Comer, “The Internet Book”, Pearson Education, 2009.
4. M. L. Young, ”The Complete reference to Internet”, Tata McGraw Hill, 2007.
5. Godbole AS & Kahate A, “Web Technologies”, Tata McGrawHill,2008.
6. Jackson, “Web Technologies”, Pearson Education, 2008.
7. B. Patel & Lal B. Barik, ” Internet & Web Technology “, Acme LearningPublishers.
8. Leon and Leon, “Internet for Everyone”, Vikas Publishing House.

Course Code	Course Title	L	T	P	C
20CM1OEC	Open Elective-Financial Services	4	0	0	2

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

- I. To gain knowledge on financial services.
- II. To understand importance of various services including banking, insurance, mutual

funds.

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents- Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview: Definition-Characterstistics-Objectives- Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market: Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-MajorIssues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

OUTCOME

To introduces meaning and functions of Financial IntermediariesTo understand the role of merchant bank and its services

To provide information regarding management of mutual funds and Regulations

To understand the role and functions of financial services MarketingTo know the structure and types of debt Instruments

To realize Foreign Exchange Market

REFERENCE BOOKS

1. Gordon , Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

SEMESTER IV

Course Code	FOOD TECHNOLOGY	L	T	P	C
20217AEC41		6	1	0	6

Aim: This course aims to help the students to understand the various properties of food and

the factors that make it vulnerable for spoilage

Objectives:

- This course is designed to understand the chemical nature and associated microbes of food and to understand the principles of food processing, preservation and manufacture.

Outcomes:

- To understand the basic food safety issues in the food market
- To develop and evaluate quality of new food products using objective and subjective methodologies.
- To understand the basic concepts in food chemistry and food analysis

Unit I

Basics of Food Technology Food chemistry: constituents of food - contribution to texture, flavour and organoleptic properties of food. Food additives - intentional and nonintentional and their functions. Enzymes in food processing.

Unit II

Microbiology of Food Sources and activity of microorganisms associated with food. Food fermentation & food chemicals. Food borne diseases - infections and intoxications. Food spoilage - causes.

Unit III

Food Processing Raw material characteristics; cleaning, sorting and grading of foods; physical conversion operations - mixing, emulsification, extraction, filtration, centrifugation, membrane separation, crystallization, heat processing.

Unit IV

Food Preservation Use of high temperatures - sterilization, pasteurization, blanching, canning - concept, procedure & application; Low temperature storage - freezing curve characteristics. Factors affecting quality of frozen foods. Irradiation preservation of foods.

Unit V

Manufacture of Food Products Bread and baked foods. Dairy products - milk processing, cheese, butter, ice-cream. Vegetable and fruit products. Edible oils and fats. Meat, poultry and fish products. Confectionery, beverages.

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Reference Books

1. Crosby, N.T. 1981. Food packaging Materials Applied Science Publishers, London.
2. David, S. Robinson. 1997. Food Chemistry and nutritive value. Longman group, UK.
3. Frazier, W.C. and Westhoff, D.C. 1988. Food Microbiology,

Course Code	Course Title	L	T	P	C
20217AEC42	BIOINSTRUMENTATION	6	1	0	6

Aim:

- The students searching for Biomedical Instrumentation Courses and Training Programs found the following related articles

Objectives:

- This course will give an understanding about the working principles, construction and applications of the instruments often used in the studies related to various disciplines of Biological Sciences.

Outcomes:

- Check for analytical functions and find the analytical function and study .
- Learn the measurement systems, errors of measurement,
- Demonstrate basic knowledge of Biotechniques

Unit I

Basic Instrumentation (Theory & Demo) Principles, operation protocol & applications of the following instruments: Weighing balance, pH meter, Polarography, Radioactivity, ECG, FTIR.

Unit II

Microscopy (Hands on) Observation of different microbes. Light – Bright & Dark field; Phase contrast, Inverted Phase contrast; Fluorescent, Electron – TEM & SEM; Confocal

Unit III

Spectroscopy (Theory & Demo) Colorimeter, Spectrometer, UV visible spectrometer, X – ray spectrometer, ELISA reader, Atomic absorption spectrometer, Flame photometer, Flourimeter & Spectro flourimeter.

Unit IV

Separation Techniques (Theory & Demo) Centrifugation - Principle, operation, types & applications. Chromatography - Principle, operation & applications - Paper – ascending, descending & Circular, TLC, HPTLC, GC, HPLC, Column Chromatography, Ion Exchange & Affinity Chromatography, LC – MS.

Unit V

Electrophoresis (Theory & Demo) Native & denatured - zone, iso-electrofocusing & isotachopheresis, 1D & 2D. PCR, MoldiTof

- S.SadasivamA. Manickam. 2004. Biochemical Methods.
- 2nd Edition. New Age International (p) Ltd, Publishers. 2. Dr. G.Rajagopal, Dr. B.D.Toora. 2005. Practical Biochemistry. 2nd Edition. Ahuja Book Company Pvt.Ltd.
- J.Jayaraman. 2000. Laboratory Manual in Biochemistry. New Age International Publishers.

Course Code	Course Title	L	T	P	C
20217SEC43L	FOOD TECHNOLOGY AND BIO INSTRUMENTATION LAB	0	0	5	3

Aim:

- To understand the principle and application of Bioinstrumentation and food technology

Objectives:

- By doing this course the students will get hand on exposure & understand the chemical nature and associated microbes of food and the principles of food processing, preservation and manufacture. And the techniques used in understanding the biological process

Outcomes:

- Ability to apply principles of food engineering in industry.
- Understand, identify and analyze a problem related to food industry and ability to find an appropriate solution for the same.

- Test for sensitivity of microorganisms.
- Down stream processes of enzymes – dialysis.
- Ion exchange chromatography – drying – cellulose column chromatography.
- Immobilization of yeast cell by alginate beads
- Bioassay techniques for antibiotics.
- Large scale production of organic acids, large scale production of solvents using fermentor (Demo) Visit to Distillery unit; alcohol production and pharmacological industries. Pasteur Institute(Field visit).
- Isolation & identification microbes from spoiled food.
- Production of yogurt, butter.
- Antibiotic production by different strains of microbes (Theory).
- Calculate BMI
- Handling of Colorimeter and Spectrophotometer

EMPLOYABILITY / ENTREPRENEURSHIP/SKILL DEVELOPMENT

- Estimation of RNA by orcinol method.
- Estimation of DNA by Diphenylamine metho, Demonstratio
- Paper chromatography for separations and detections of simple sugars and amino acids.
- Separation of plant pigments by column chromatography.
- Thin layer chromatography of amino acids.

Refrence book:

- Laboratory Mannual in Biochemistry by J. Jayaraman. New Age International Publishers. 2nd Edn. 1981.
- Stanbury, P.F., A. Whitaker ans S.J. Hall. 1995. Principles of fermentation Technology, Pergamon, UK.

Course Code	Course Title	L	T	P	C
20217 DSC44A	GENE THERAPY UTILIZATION PHARMACOLOGY	5	0	0	4

Aim:

- After successful completion of the paper the students will get an overall view about genetic makeup of organisms and can take up a career in research.

Objective:

- This paper in genetics has been structured to give the student an in depth knowledge of the organization of the genome in prokaryotes and eukaryotes, the principles of genetic inheritance and other vital aspects such as Hardy Weinberg law, pedigree analysis and the genetic basis of disease inheritance.

Outcomes:

- understand some of the types of disease that might be treatable by gene therapy
- understand the basic principals of genetic manipulation
- Understand how genetics may be used in the design of drugs..

UNIT I: History of genetics

Gene as the unit of mutation and recombination. Identification of DNA as the genetic material. Mutations: Molecular nature, mutagenesis by nitrous acid, hydroxylamine, alkylating agents, intercalators and UV, origin of spontaneous mutations and control, parasexual process in bacteria, transformation, transduction and conjugal gene transfer the phenomena, mechanisms and applications. Fine structure genetic analysis with examples.

UNIT II: Genetic mapping

Haplotype, Physical and Cytogenetic mapping, SNP, RFLP, TRE, PCR-OLA, SSCP, RAPD

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

UNIT III: Identifying human disease genes

General gene therapy strategies, Targeted killing of specific cells, Targeted mutation correction, Targeted inhibition of gene expression. Gene replacement therapy by viral vectors: Oncovirus, Lentivirus, Adenovirus, Adenoassociated virus, Herpes Simplex virus, Naked DNA or direct injection or particle bombardment-gene gun, Liposome mediated DNA transfer, Receptor mediated endocytosis, Repair of mutations in situ through the cellular DNA repair machinery, Antisense induced exon splicing, In-utero fetal gene therapy

UNIT IV: Gene blocking therapies

Gene Knockouts, Gene disruption-p53, prion diseases, immunological, short RNA, Gene therapy for non-inheritable diseases, stem cell therapy, somatic cell gene therapy and germ line gene therapy

UNIT V: Gene therapy: problem, solutions and future prospects

Controversial issues in medical genetics

In vitro fertilization, Prenatal sex determination, Surrogate therapy, Genetic counseling, Germline gene therapy, ELSI, NBAC, IPR, Patenting, Human transgene

Reference Books:

- Human Molecular Genetics- Tom Strachan
- Concepts of Genetics- William s. Klug
- Emery's Elements of Medical Genetics- Robert F. Mueller & Ian D. Young
- Concepts of Genetics – W.S. Klug and M.R. Cummm Prentice Hall, 1997.
- Introduction of Genetic Analysis of Griffiths – Freeman Co., 1996.

Course Code	Course Title	L	T	P	C
20217 DSC44B	PLANT CONSERVATION & DISASTER MANAGEMENT	5	0	0	4

Aim:

- Understanding foundations of hazards, disasters and associated natural/social phenomena.

Objective:

- To maintain essential ecological processes and life supporting systems.
- To preserve the diversity of species or the range of genetic material found in the worlds organisms.
- The course focuses on the reasons responsible for disaster, its impact on the environment and society. To impart the knowledge on the measures and steps to minimise or overcome the burden on the ecosystem.

Outcomes:

- To make sustainable utilization of species and ecosystems.
- Familiarity with disaster management theory (cycle, phases) Knowledge about existing global frameworks and existing agreements (e.g. Sendai)

UNIT I: Plant Diversity

Biodiversity – Concept and Definition Scope and Constraints of Biodiversity Science, Composition and Scales of Biodiversity: Genetic Diversity, Species/ Organismal Diversity, Ecological/ Ecosystem Diversity, Landscape/ Pattern Diversity, Agrobiodiversity, Biocultural Diversity and Urban Biodiversity.

UNIT II: Conservation challenges in the twenty first century

Urbanisation; Creating knowledge society, Conflict management and decision making, Management of introduced species. 18 Evaluation of priorities for conservation of habitats and species Selection criteria for protection of species – species quality, IUCN Guidelines for Red List categories and criteria (version 7.0), Red List of Indian Flora and Fauna, Selection criteria for protection of habitats – hotspots, Conservation

EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

UNIT III : Introduction to Disasters

Natural Disasters –Educative – Trends in Climatology, Meteorology and Hydrology. Seismic Activities. Changes in Coastal Zone, Coastal Erosion, Beach Protection. Coastal Erosion due to Natural and Manmade Structures.

UNIT IV : Types of Disasters – Natural

Disasters – Nature and characteristics of Cyclones – Tornadoes – Avalanches – Flood – Drought – Volcanic – Earthquakes – Fire – Landslides – Causes and effects - Impact on Environment- Forecasting and Warning System – Disaster Profile of India. Manmade disasters: Nuclear, chemical, fire explosion, accidents, bioweapons. Deforestation, monoculture, Building construction.

UNIT V : Disaster Management

Disaster Management Cycle- Predisaster Planning -Training of Disaster – Prone Areas – Prioritization – Regulations – Protection Measures during Disaster and Post Disaster. Relief Camp Organization — Disaster Training – Role of Information and Communication Technology, GPS, Remote Sensing and Geographic Information System in Disaster Management.

REFERENCES:

- Hambler C and SM Cannly, (2013). Conservation. Cambridge University Press
- Van Dyke F, (2008). Conservation Biology Foundations, Concepts, Applications 2nd Edition, Springer
- Natural Hazards, Bryant Edwards (2005), Cambridge University Press, U.K.
- Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Roy, P.S. (2000), Indian Institute of Remote Sensing (NRSA), Dehradun.
- Natural Disaster, Sharma, R.K. & Sharma, G. (2005), (ed) APH Publishing Corporation, New Delhi



M.PHIL – BIOTECHNOLOGY

COURSE STRUCTURE

PAPER- III - ENVIRONMENTAL BIOTECHNOLOGY (Sub. Code: 203BTE13)

UNIT – I

Environment: Basic concepts –Environmental Pollution: Types of pollution, Pollution monitoring and measurement; Methodology of environmental management – The problem solving approach and its limitations.

UNIT – II

Biofertilizers- Definition, Distinguished Features of Biofertilizers and Organic Manures. Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM). Bioleaching- Ore Leaching and Role of Microbes in Mines (copper, and Uranium). Environmental significance of Genetically modified microbes, plants and animals. Bio- assessment of environmental quality.

UNIT – III

Sewage/Waste water treatment - collection, Primary treatment, Secondary treatment –Aerobic process: Activated sludge, Oxidation ditches, Trickling filters, towers, rotating discs, rotating drums, oxidation ponds. Anaerobic processes: Anaerobic digestion, Anaerobic filters, Tertiary treatment. Waste water treatment for some industries - dairy, distillery, tannery, sugar, antibiotic industries. Water recycling.

UNIT – IV

Solid waste treatment and disposal - : Sources and management - Composting, vermiculture and methane production. Biodegradation and bioremediation - Xenobiotics Hydrocarbons, oil pollution, surfactants, pesticides.

UNIT – V

Global environmental problems: Ozone depletion, Green house effect and acid rain, their Bioremediation of contaminated soils and waste land.

Paper II ADVANCED BIOTECHNOLOGY (Sub. Code: 203BTC12)

UNIT – I

INTRODUCTION TO GENETIC ENGINEERING

Salient features of cloning vectors, restriction enzymes and their mode of action, recombinant DNA- types of cloning vectors, plasmids, cosmids, M-13 Phage. Microinjection, particle bombardment, electroporation (Vector less mode), Construction of genomic DNA library and cDNA library.

UNIT– II

PLANT BIOTECHNOLOGY

Vectors for gene transfer (Ti , Ri plasmids, cointegrate, intermediate and helper plasmids) Binary vectors, viruses as vectors gene transfer techniques using Agrobacterium, selectable markers, reporter genes and promoters , transgenic plants, crop improvement , resistance to herbicide insects, pests and viruses, cytoplasmic male sterility, delayed fruit ripening, antibody vaccine and interferon production in plants, synthetic seeds.

UNIT – III

BIOPROCESS

Bioreactor designs and types of fermentation and fermentors. Concepts & basic modes of fermentation - Batch, fed batch and continuous fermentation. Conventional fermentation versus biotransformation. Solid substrate, surface and submerged fermentation. Fermentation economics and fermentation media. Fermenter design - mechanically agitated, pneumatic and hydrodynamic fermenters. Large scale animal and plant cell cultivation and air sterilization. Upstream processing - media formulation, sterilization, aeration and agitation. Measurement and control of bioprocess parameters, scale up and scale down process

UNIT- IV

TECHNIQUES IN BIOTECHNOLOGY

PCR- key concept- applications- PCR variants- analysis of amplified product by gel electrophoresis- Nucleic acid blotting techniques- sequencing – Sangers method, Maxam and Gilbert method- primer walking- automated sequencing- DNA chips and microarray-DNA fingerprinting.

UNIT – V

BIOTECHNOLOGY – INTELLECTUAL PROPERTY

- i) Intellectual property of rights, patents, trade secrets, copyrights, trade mark, choice of Intellectual Property Protection (IPR), and Plant genetic Resources (PGR), GATT (Genetic Agreement of Tariff and Trade), TRIP (trade Related Intellectual property).
- ii) Patents for higher plants, patenting transgenic organism and isolated genes, patenting genes and DNA sequences, Plant Breeders Rights (PBR) and farmers Right.
- iii) Ethical issues in animal biotechnology. Management aspects of biotechnology and genetic engineering.



PRIST
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UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM HANDBOOK

B.TECH(CIVIL ENGINEERING)FULL TIME

[REGULATION 2020]

[for candidates admitted to B.Tech (Civil Engineering) program from June 2020 onwards]

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

COURSE STRUCTURE

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

I - VIII SEMESTERS CURRICULUM AND SYLLABI

B.TECH (FT) CIVIL

[REGULATION 2020]

SEMESTER I

Sl.No	Course Code	Course Title	Periods			Credit
			Per Week			
			L	T	P	
THEORY						
1	20147S11	Communicative English	4	0	0	4
2	20148S12	Engineering Mathematics – I	3	2	0	4
3	20149S13	Engineering Physics	3	0	0	3
4	20149S14	Engineering Chemistry	3	0	0	3
5	20154S15	Engineering Graphics	2	0	4	4
6	20150S16	Problem Solving and Python Programming	3	0	0	3
PRACTICAL S						
7	20150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	20149L18	Physics and Chemistry Laboratory	0	0	3	2
9	201AGIT	Induction Training Programme				2
		TOTAL				25

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S21	Technical English(All Branches)	4	0	0	4
2.	20148S22A	Engineering Mathematics II(All Branches)	4	0	0	4
3.	20149S23D	Physics for Civil Engineering	3	0	0	3
4.	20149S24A	Environmental Science And Engineering	3	0	0	3
5.	20153S25E	Basic Electrical And Electronics Engineering	3	0	0	3
6.	20154S26D	Engineering Mechanics	3	2	0	4
PRACTICALS						
7.	20154L27	Engineering Practices Laboratory	0	0	3	2
8.	20155L28E	Computer Aided Building Drawing Lab	0	0	3	2
9.	201AGIC	Indian Constitution				2
10.	201ASBE	Basic Behavioral Etiquette				2
TOTAL			21	0	8	25

SEMESTER III

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20148S31C	Transforms and Partial Differential Equations	4	0	0	4
2	20155C32	Engineering Geology	3	0	0	3
3	20155C33	Construction Materials	3	0	0	3
4	20155C34	Strength of Materials –I	3	0	0	3
5	20155C35	Fluid Mechanics	3	2	0	4
6	20155C36	Surveying	4	0	0	3
PRACTICALS						
7	20155L37	Surveying Laboratory	0	0	3	2
8	20155L38	Construction Materials Laboratory	0	0	3	2
9	20147L39	Interpersonal Skills / Listening and Speaking	0	0	2	1
10	201AGGS	Introduction to Gender Studies				2
TOTAL						25

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20148S41C	Numerical Methods	4	0	0	4
2	20155C42	Construction Techniques and Practices	3	0	0	3
3	20155C43	Strength of Materials II	4	0	0	4
4	20155C44	Applied Hydraulic Engineering	3	0	0	3
5	20155C45	Concrete Technology	3	0	0	3
6	20155C46	Soil Mechanics	3	0	0	3
PRACTICALS						
7	20155L47	Strength of Materials Lab	0	0	3	2
8	20155L48	Hydraulic Engineering Lab	0	0	3	2
9	20147L49	Advanced Reading & Writing	0	0	2	1
10	20155CRS	Research Led Seminar	0	0	2	1
11	201AGCE	Community Engagement				2
12	201ASGS	Technical, General Aptitude and Skill Set Development				2
TOTAL						26

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER – V

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C51	Design of Reinforced Cement Concrete Elements	4	0	0	4
2	20155C52	Structural Analysis I	3	2	0	4
3	20155C53	Water Supply Engineering	3	0	0	3
4	20155FE54	Open Elective I	3	0	0	3
5	20155E55	Elective I	3	0	0	3
6	20155C56	Foundation Engineering	3	0	0	3
PRACTICALS						
7	20155L57	Soil Mechanics Lab	0	0	3	2
8	20155L58	Water and Waste Water Analysis Lab	0	0	3	2
9	20155L59	Survey Camp	0	0	2	2
10	20155CRM	Research Methodology	0	0	2	3
11	201AGIE	Innovation and Entrepreneurship				2
TOTAL						29

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

SEMESTER – VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C61	Design of Steel Structural Elements	3	0	0	3
2	20155C62	Structural Analysis II	3	2	0	4
3	20155C63	Irrigation Engineering	3	0	0	3
4	20155C64	Highway Engineering	3	0	0	3
5	20155C65	Waste Water Engineering	3	0	0	3
6	20155E66	Elective II	3	0	0	3
PRACTICALS						
7	20155L67	Highway Engineering Laboratory	0	0	3	2
8	20155L68	Irrigation and Environmental Engineering Drawing	0	0	3	2
9	20147L69	Professional Communication	0	0	2	1
10	20155CBR	Participation in Bounded Research	0	0	2	1
11	201ASTI	Technical Training				2
TOTAL						25

SEMESTER – VII

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C71	Estimation , Costing & Valuation Engineering	4	0	0	4
2	20155C72	Railways, Airports, Docks And HarbourEngineering	3	2	0	4
3	20155C73	Structural Design and drawing	3	2	0	4
4	20155FE74	Open Elective II	4	0	0	3
5	20155E75	Elective III	4	0	0	3
PRACTICALS						
6	20155L76	Creative and Innovation project (activity based –subject related)	0	0	4	2
7	20155L77	Industrial Training (4 Weeks during VI th SemSummer)	0	0	0	2
8	20155L78	Technical Seminar	0	0	2	1
9	20155CSR	Design / Socio Technical Project	0	0	4	3
TOTAL						26

SEMESTER – VIII

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81	Elective IV	3	0	0	3
2	20155E82	Elective V	3	0	0	3
3	20155PW83	Project Work	0	0	30	10
4	20155PEE	Program Exit Exam				2
5	201AGPE	Professional Ethics and Human Values				2
6	201ASIM	Interview Skills Training and Mock Test				2
TOTAL						18

CREDITS DISTRIBUTION

CGPA CREDITS

Semester	Core	Elective Courses	Open Electives	Practical	Seminar	Exit Exam	Project	RSD Course	Total
I	21	-	-	04	-	-	-	-	25
II	21	-	-	04	-	-	-	-	25
III	20	-	-	05	-	-	-	-	25
IV	21	-	-	05	-	-	-	01	26
V	14	03	03	06	-	-	-	03	29
VI	16	03	-	05	-	-	-	01	25
VII	12	03	03	04	01	-	-	03	26
VIII	-	06	-	-	-	02	10	-	18
Total Credits									199

NON CGPA CREDITS

Semester	Audit courses	Total
I	01	01
II	02	02
III	01	01
IV	02	02
V	01	01
VI	01	01
VII	-	-
VIII	02	02
TOTAL NON CGPA CREDITS		10

TOTAL CREDITS	
CGPA CREDITS	199
NON CGPA CREDITS	10
TOTAL	209

LIST OF ELECTIVES**SEMESTER – V****ELECTIVE I**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E55A	Construction Equipment and Automation	3	0	0	3
2	20155E55B	Principles of Architecture	3	0	0	3
3	20155E55C	Geographic Information System	3	0	0	3
4	20155E55D	Forensic Engineering & Rehabilitation	3	0	0	3
5	20155E55E	Energy Efficient Buildings	3	0	0	3

SEMESTER – VI**ELECTIVE II**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E66A	Energy and Environment	3	0	0	3
2	20155E66B	Environmental Policies and Legislation	3	0	0	3
3	20155E66C	Sustainable Urban Development Concepts and Strategies	3	0	0	3
4	20155E66D	Instrumental Methods and Analysis of Environmental Pollutants	3	0	0	3
5	20155E66E	Air pollution and control Engineering	3	0	0	3

SEMESTER – VII**ELECTIVE III**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E75A	Building Automation & Management System	3	0	0	3
2	20155E75B	Design of Prestressed concrete structures	3	0	0	3
3	20155E75C	Pavement Design	3	0	0	3
4	20155E75D	Town Planning	3	0	0	3
5	20155E75E	Smart materials and smart structures	3	0	0	3

SEMESTER – VIII**ELECTIVE IV**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81A	Environmental Economics	3	0	0	3
2	20155E81B	Simulation and Modeling in Environmental Systems	3	0	0	3
3	20155E81C	Membrane Separation for Water and Waste water	3	0	0	3
4	20155E81D	Theory and Practice of Industrial Wastewater Treatment	3	0	0	3
5	20155E81E	Geo-environmental Engineering	3	0	0	3

ELECTIVE V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E82A	Airport & Waterways Engineering	3	0	0	3
2	20155E82B	Surface Hydrology	3	0	0	3
3	20155E82C	Prefabricated structures	3	0	0	3
4	20155E82D	Contracts Management	3	0	0	3
5	20155E82E	Sustainable Construction methods	3	0	0	3

OPEN ELECTIVE-I

1	20150FE54A	Database Management Systems (CSE)	3	0	0	3
2	20150FE54B	Cloud Computing (CSE)	3	0	0	3
3	20152FE54A	Basic Of Bio Medical Instrumentation (ECE)	3	0	0	3
4	20152FE54B	Sensor and Transducers (ECE)	3	0	0	3
5	20153FE54A	Industrial Nano Technology (EEE)	3	0	0	3
6	20153FE54A	Energy Conservation and Management (EEE)	3	0	0	3
7	20154FE54A	Renewable Energy Sources (MECH)	3	0	0	3
8	20154FE54B	Automotive Systems (MECH)	3	0	0	3

OPEN ELECTIVE-II

1	20150FE74A	Introduction to C Programming (CSE)	3	0	0	3
2	20150FE74B	Data Structures & Algorithms (CSE)	3	0	0	3
3	20152FE74A	Robotics (ECE)	3	0	0	3
4	20152FE74B	Electronic Devices (ECE)	3	0	0	3
5	20153FE74A	Basic Circuit Theory (EEE)	3	0	0	3
6	20153FE74B	Introduction to Renewable Energy Systems (EEE)	3	0	0	3
7	20154FE74A	Industrial Safety (MECH)	3	0	0	3
8	20154FE74B	Testing of Materials (MECH)	3	0	0	3

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

1. To develop the basic reading and writing skills of first year engineering and technology students.
2. To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
3. To help learners develop their speaking skills and speak fluently in real contexts.
4. To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting-**Writing-** completing sentences- - developing hints. **Listening-** short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information-**Language development-** What Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development-** prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-**telephonic conversations. **Speaking-** sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-**guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** –listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email-**Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself-speaking about one's friend- **Language development-**Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

Reading- longer texts- close reading-**Writing-** brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations-**Speaking-** participating in conversations- short group conversations-**Language development-**modal verbs-present/ past perfect tense – **Vocabulary development-**collocations- fixed and semi-fixed expressions

OUTCOMES: At the end of the course, learners will be able to:

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

1. Board of Editors. **Using English** A Course book for Under Graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

REFERENCES

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. **Speaking Effectively: Developing Speaking Skills for Business English**. Cambridge University Press, Cambridge: Reprint 2011
3. Dutt P. Kiranmai and Rajeevan Geeta. **Basic Communication Skills**, Foundation Books: 2013
4. Means, L. Thomas and Elaine Langlois. **English & Communication For Colleges**. Cengage Learning, USA: 2007
5. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book & Workbook) Cambridge University Press, New Delhi: 2005.

OBJECTIVES:

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

After completing this course, students should demonstrate competency in the following

- skills: Use both the limit definition and rules of differentiation to differentiate functions.

Apply differentiation to solve maxima and minima problems.

- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II WAVES AND FIBER OPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL: 45 PERIODS**OUTCOMES:**

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications, the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H. Freeman, 2007.

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and watertreatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement. Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis–Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS**OUTCOMES:**

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces. draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL : 45 PERIODS**OUTCOMES:****Upon completion of the course, students will be able to**

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.

Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs.

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data **from/to files in Python.**

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

TOTAL: 60 PERIODS

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

OUTCOMES:

Upon completion of the course, students will be able to

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermalphysics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
7. Determination of wavelength of mercury spectrum – spectrometer grating
Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)**OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014)

The Induction Program is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding with in them, build relations between teachers and students, give a broader view of life, and building of character.

Induction program	3 weeks duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

OBJECTIVES:

The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** – Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing**- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** – subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 12

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting charts, graphs- **Vocabulary Development** - vocabulary used in formal letters/emails and reports **Language Development**- impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 12

Listening- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**- Describing a process, use of sequence words- **Vocabulary Development**- sequence words- Misspelled words. **Language Development**- embedded sentences.

UNIT IV REPORT WRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter – Résumé preparation(via email and hard copy)- analytical essays and issue based essays--**Vocabulary Development**- finding suitable synonyms- paraphrasing-. **Language Development**- clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12

Listening- TED/Ink talks; **Speaking** – participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey- **Vocabulary Development**- verbal analogies **Language Development**- reported speech.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course learners will be able to:

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully. Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Booth-L. Diana, **Project Work**, Oxford University Press, Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations**, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad, 2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.** Oxford University Press: New Delhi, 2014.

OBJECTIVES:

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modeling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES**12**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS**12**

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS**12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $w = z + c, cz, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION**12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS**12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS**OUTCOMES:**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O’Neil, P.V. “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, “Engineering Mathematics”, Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., “Advanced Engineering Mathematics” “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

OBJECTIVE:

- To introduce the principles of thermal, acoustics, optics and new materials for civil engineering applications.

UNIT I THERMAL PERFORMANCE OF BUILDINGS 9

Heat transfer through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices central heating. Principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners - chilled water plant - fan coil systems - water piping - cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A. C. Systems.

UNIT II ACOUSTICS 9

Classification of sound- decibel- Weber–Fechner law – Sabine’s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions - absorbing materials - noise and its measurements, sound insulation and its measurements, impact of noise in multi-storeyed buildings.

UNIT III LIGHTING DESIGNS 9

Radiation quantities – spectral quantities – relationship between luminescence and radiant quantities – hemispherical reflectance and transmittance – photometry: cosines law, inverse square law. Vision – photopic, mesopic, scotopic visions. Colour – luminous efficiency function - Visual field glare, colour - day light calculations - day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV NEW ENGINEERING MATERIALS 9

Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics - High Aluminium ceramics.

UNIT V HAZARDS 9

Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will have knowledge on the thermal performance of buildings, the students will acquire knowledge on the acoustic properties of buildings, the students will get knowledge on various lighting designs for buildings,
- the students will gain knowledge on the properties and performance of engineering materials, and the students will understand the hazards of buildings.

TEXT BOOKS:

1. Alexander, D. “Natural disaster”, Springer (1993).
2. Budinski, K.G. & Budinski, M.K. “Engineering Materials Properties and Selection”, Prentice Hall, 2009.
3. Severns, W.H. & Fellows, J.R. “Air conditioning and Refrigeration”, John Wiley and Sons, London, 1988.
4. Stevens, W.R., “Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.

REFERENCES:

1. Gaur R.K. and Gupta S.L., Engineering Physics. Dhanpat Rai publishers, 2012.
2. Reiter, L. “Earthquake hazard analysis - Issues and insights”, Columbia University Press, 1991.
3. Shearer, P.M. “Introduction to Seismology”, Cambridge University Press, 1999.

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment

SKILL DEVELOPMENT**EMPLOYABILITY****ENTREPRENEURSHIP**

production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hyderabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning IndiaPVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

OBJECTIVES:

- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications. To explain the principles of digital electronics
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 9

Fundamental laws of electric circuits – Steady State Solution of DC Circuits – Introduction to AC Circuits – Sinusoidal steady state analysis – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Classification of instruments – Operating Principles of indicating Instruments

UNIT II ELECTRICAL MACHINES 9

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Introduction - Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 9

Binary Number System – Boolean Algebra theorems – Digital circuits - Introduction to sequential Circuits – Flip-Flops – Registers and Counters – A/D and D/A Conversion – digital processing architecture.

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 9

Introduction – Elements of Communication Systems – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication - Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 45 PERIODS

OUTCOMES:

- ability to identify the electrical components and explain the characteristics of electrical machines.
- ability to identify electronics components and understand the characteristics

TEXT BOOKS:

1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGrawHill Education(India) Private Limited, Third Reprint ,2016
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India, 2011
3. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006

REFERENCES:

1. A.E. Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education(India) Private Limited, 2009
2. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
3. Leonard S Bobrow, "Foundations of Electrical Engineering", Oxford University Press, 2013
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
6. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I STATICS OF PARTICLES 9+6

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 9+6

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9+6

Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia – mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9+6

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS 9+6

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : (45+30)=75 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- illustrate the vectorial and scalar representation of forces
- and moments analyse the rigid body in equilibrium
- evaluate the properties of surfaces and
- solids calculate dynamic forces exerted in rigid body
- determine the friction and the effects by the laws of friction

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, “Engineering Mechanics”, Oxford University Press (2010)

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, 1998.
2. Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons, 1993.
5. Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE****14****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.
- (b) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (c) Study of pipe connections requirements for pumps and turbines.
- (d) Preparation of plumbing line sketches for water supply and sewage works.
- (e) Hands-on-exercise:
- (f) Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (g) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE**18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays and funnels.
- (c) Different type of joints.

- (a) Study of centrifugal pump
- (b) Study of air conditioner

- (a) Smithy operations, upsetting, swaging, setting down and bending.
Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE****12****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

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1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- fabricate carpentry components and pipe connections including plumbing works. use welding equipments to join the structures.
 - Carry out the basic machining operations Make the models using
 - sheet metal works Illustrate on centrifugal pump, Air conditioner,
 - operations of smithy, foundry and fittings
 - Carry out basic home electrical works and
 - appliances Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
 - (a) Rotary Hammer 2 Nos
 - (b) Demolition Hammer 2 Nos
 - (c) Circular Saw 2 Nos
 - (d) Planer 2 Nos
 - (e) Hand Drilling Machine 2 Nos
 - (f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets

2. Electrical measuring instruments	10	Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp		1 each
4. Megger (250V/500V)	1	No.
5. Power Tools: (a) Range Finder	2	Nos
		Nos
(b) Digital Live-wire detector	2	

ELECTRONICS

1. Soldering guns	10	Nos.
2. Assorted electronic components for making circuits	50	Nos.
3. Small PCBs	10	Nos.
4. Multimeters	10	Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply		

OBJECTIVES:

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS

1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. Buildings with load bearing walls
3. Buildings with sloping roof
4. R.C.C. framed structures.
5. Industrial buildings – North light roof structures

TOTAL: 60 PERIODS**OUTCOMES:**

- The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures, and framed buildings using computer softwares.

TEXTBOOKS:

1. Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008

REFERENCES:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook: A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
4. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.

Aim:

- To understand the salient features of the Indian Constitution

Objectives:

- To make the students understand about the Democratic Rule and Parliamentary Administration.
- To appreciate the salient features of the Indian Constitution.
- To know the fundamental Rights and Constitutional Remedies.
- To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
- To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

Outcomes

- Democratic values and citizenship Training are gained.
- Awareness on Fundamental Rights are established.
- The functions of union Government and State Governments are learnt.
- The power and functions of the Judiciary learnt thoroughly.
- Appreciation of Democratic Parliamentary Rule is learnt.

UNIT I: The Making Of Indian constitution

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: Fundamental Rights And Fundamental Duties Of The Citizens

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties.

UNIT III: Directive Principles Of State Policy

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: The Union Executive, Union parliament And Supreme Court

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister Rajya Sabha- Lok Sabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

UNIT V: State Council – Election System And Parliamentary Democracy In India

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

References:

1. Palekar S.A. Indian Constitution Government and politics, ABD Publications, India.
2. Aiyer Alladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. Kashyap Subash C Our Parliament, National Book, Trust New Delhi 1989.

OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations. To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

OUTCOMES :

- Upon successful completion of the course, students should be able to:
- Understand how to solve the given standard partial differential equations.
 - Solve differential equations using Fourier series analysis which plays a vital role in engineering applications. Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
 - Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
 - Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt.Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

OBJECTIVE:

- At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor.

UNIT I PHYSICAL GEOLOGY 9

Geology in civil engineering – branches of geology – structure of earth and its composition weathering of rocks – scale of weathering – soils - landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics – Earth quakes – Seismic zones in India.

UNIT II MINEROLOGY 9

Physical properties of minerals – Quartz group, Feldspar group, Pyroxene - hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III PETROLOGY 9

Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS 9

Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V APPLICATION OF GEOLOGICAL INVESTIGATIONS 9

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings - Hydrogeological investigations and mining - Coastal protection structures. Investigation of Landslides, causes and mitigation.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing this course

- Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
 - Will get basics knowledge on properties of minerals.
 - Gain knowledge about types of rocks, their
 - distribution and uses. Will understand the methods of
 - study on geological structure.
- Will understand the application of geological investigation in projects such as dams, tunnels, bridges, roads, airport and harbor

TEXT BOOKS:

1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.
3. Gokhale KVGK, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2011.
4. Chenna Kesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009.
5. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.

REFERENCES:

1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
2. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
3. Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988.

OBJECTIVE:

- To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR 9

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing Process – Batching plants – mixing – transporting – placing – compaction of concrete – curing and finishing – Ready mix Concrete – Mix specification.

UNIT IV TIMBER AND OTHER MATERIALS 9

Timber – Market forms – Industrial timber – Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.

UNIT V MODERN MATERIALS 9

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

TOTAL: 60 PERIODS**OUTCOMES:**

On completion of this course the students will be able to

- Compare the properties of most common and advanced building materials. understand the typical and potential applications of lime, cement and aggregates
- know the production of concrete and also the method of placing and making of concrete elements. understand the applications of timbers and other materials
- Understand the importance of modern material for construction.

TEXT BOOKS:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
4. Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008.

REFERENCES:

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGrawHill Educations Pvt. Ltd, New Delhi, 2012.
3. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
4. IS4926 - 2003: Indian Standard specification for ready-mixed concrete, 2012
5. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011
6. IS1542-1992: Indian standard specification for sand for plaster, 2009
7. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009

OBJECTIVES:

- To learn the fundamental concepts of Stress, Strain and deformation of solids.□
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.□ To understand the effect of torsion on shafts and springs.□
- To analyze plane and space trusses□

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 12

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.

UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS 12

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams - Leaf Springs.

UNIT III DEFLECTION OF BEAMS**12**

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION**12**

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel – Design of buffer springs.

UNIT V ANALYSIS OF TRUSSES**12**

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to

- Understand the concepts of stress and strain, principal stresses and principal planes.
- Determine Shear force and bending moment in beams and understand concept of theory of simple bending. Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
- Apply basic equation of torsion in design of circular shafts and helical springs, .Analyze the pin jointed plane and space trusses

TEXTBOOKS:

1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications.New Delhi, 2015
3. Rattan . S. S, “Strength of Materials”, Tata McGraw Hill Education Private Limited, New Delhi, 2012
4. Bansal. R.K. “Strength of Materials”, Laxmi Publications Pvt. Ltd., New Delhi, 2010

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van Nos Reinhold, New Delhi 1999.
2. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, NewDelhi,1995.
3. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House,New Delhi 2016.
4. Singh. D.K., “ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016
5. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2010.
6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

OBJECTIVE:

- To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze and appreciate the complexities involved in solving the fluid flow problems.

UNIT I FLUID PROPERTIES AND FLUID STATICS 12

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT II FLUID KINEMATICS AND DYNAMICS 12

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 12

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem - dimensionless parameters - similitudes and model studies - distorted models.

UNIT IV FLOW THROUGH PIPES 12

Reynold's experiment - laminar flow through circular pipe (Hagen poiseulle's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor-Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT V BOUNDARY LAYER 12

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer- displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of the course students will be able to

- Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium. Understand and solve the problems related to equation of motion.
- Gain knowledge about dimensional and model analysis. Learn types of flow and losses of flow in pipes.
- Understand and solve the boundary layer problems.

TEXT BOOKS:

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2. Jain.A.K., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
3. Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.
3. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.
5. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

OBJECTIVES:

- To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- To introduce the concepts of Control
- Surveying To introduce the basics of Astronomical Surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING 12

Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling – Datum- - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling - Curvature and refraction.

UNIT II THEODOLITE AND TACHEOMETRIC SURVEYING 12

Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring - Contour gradient – Uses of contour plan and map

UNIT III CONTROL SURVEYING AND ADJUSTMENT 12

Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale’s table. - Errors Sources- precautions and corrections – classification of errors –true and most probable values - weighed observations – method of equal shifts – principle of least squares - normal equation – correlates-level nets- adjustment of simple triangulation networks.

UNIT IV ADVANCED TOPICS IN SURVEYING 12

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour and methods- Astronomical terms and definitions-coordinate systems-different time systems-Nautical corrections-Field observations and determination altitude and hour angle method

UNIT V MODERN SURVEYING 12

Total Station : Advantages - Fundamental quantities measured- Parts and a principle On board calculations - Field procedure - Errors and good station GPS Surveying : Different segments – space control configuration-signal structure - Orbit determination and representation. Selective availability- Task of control segment –processing – traversing and triangulation.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of the course the student will be able to

- understand The use of various surveying
- instruments and mapping
- Measuring Horizontal angle and vertical angle using different
- instruments Methods of Leveling and setting Levels with different instruments

Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth Concept and principle of modern surveying.

TEXTBOOKS:

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune,2008
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, NewDelhi, 2005
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill,2001.
4. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
5. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1993
6. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2014

REFERENCES:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2003.
3. SatheeshGopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
5. Arora K.R., "Surveying Vol I & II", Standard Book house, 10th Edition 2008

OBJECTIVE:

- To facilitate the understanding of the behavior of construction materials.

I. TEST ON FINE AGGREGATES **12**

1. Grading of fine aggregates
2. Test for specific gravity and test for bulk density
3. Compacted and loose bulk density of fine aggregate

II. TEST ON COARSE AGGREGATE **12**

1. Determination of impact value of coarse aggregate
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

III. TEST ON CONCRETE **12**

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder
4. Test for Flexural strength

IV. TEST ON BRICKS AND BLOCKS **12**

1. Test for compressive strength of bricks and blocks
2. Test for Water absorption of bricks and blocks
3. Determination of Efflorescence of bricks
4. Test on tiles

TOTAL: 60 PERIODS**OUTCOME:**

- The students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.

REFERENCES:

1. Construction Materials Laboratory Manual, Anna University, Chennai-600 025.
2. IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by dry sieving.
3. IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete
4. IS 383 – 1970 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.

OBJECTIVE:

- At the end of the course the student will possess knowledge about Survey field techniques

LIST OF EXPERIMENTS:**Chain Survey 12**

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset
2. Setting out works – Foundation marking using tapes single Room and Double Room

Compass Survey 12

3. Compass Traversing – Measuring Bearings & arriving included angles

Levelling - Study of levels and levelling staff

4. Fly levelling using Dumpy level & Tilting level
5. Check levelling

Theodolite - Study of Theodolite 12

6. Measurements of horizontal angles by reiteration and repetition and vertical angles
7. Determination of elevation of an object using single plane method when base is accessible/inaccessible.

Tacheometry – Tangential system – Stadia system 12

8. Determination of Tacheometric Constants
9. Heights and distances by stadia Tacheometry
10. Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles 12

12. Traverse using Total station and Area of Traverse
13. Determination of distance and difference in elevation between two inaccessible points using Total station

TOTAL: 60 PERIODS**OUTCOME:**

- Students completing this course would have acquired practical knowledge on handling basic survey instruments including Theodolite, Tacheometry, Total Station and GPS and have adequate knowledge to carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and Location of site etc.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity
1.	Total Station	3 Nos
2.	Theodolites	Atleast 1 for every 5 students
3.	Dumpy level / Filling level	Atleast 1 for every 5 students
4.	Pocket stereoscope	1
5.	Ranging rods	1 for a set of 5 students
6.	Levelling staff	
7.	Cross staff	
8.	Chains	
9.	Tapes	
10.	Arrows	
11.	Prismatic Compass	10 nos
12.	Surveyor Compass	2 nos
13.	Survey grade or Hand held GPS	3 nos

OBJECTIVES:

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentations.

UNIT I**6**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II**6**

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III**6**

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV**6**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V**6**

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL: 30 PERIODS**OUTCOMES:**

At the end of the course Learners will be able to:

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXTBOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
3. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

COURSE OUTLINE**Unit-I Concepts**

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

Unit-II Feminist Theory

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, eco-feminist.

Unit-III Women's Movements: Global, National and Local

Rise of Feminism in Europe and America. Women's Movement in India.

Unit-IV Gender and Language

Linguistic Forms and Gender. Gender and narratives.

Unit-V Gender and Representation

Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

OBJECTIVES :

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differentialequations.
- To understand the knowledge of various techniques and methods of solving various types of partialdifferential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by power method and Jacobi’s method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation- Cubic Splines - Difference operators and relations Interpolation intervals-with equal - Newton’s forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson’s 1/3 rule – Romberg’s Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson’s 1/3 rule – Romberg’s Method - Two point and three point simpson’s 1/3 rule

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods - Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne’s and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS**OUTCOMES :**

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Upon successful completion of the course, students should be able to:

- Understand the basic concepts and techniques of solving algebraic and transcendental equations.
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

OBJECTIVE:

- The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I CONSTRUCTION TECHNIQUES 9

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism – floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones.

UNIT II CONSTRUCTION PRACTICES 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick – weather and water proof – roof finishes – acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of this course, students will be able to:

- know the different construction techniques and structural systems
- Understand various techniques and practices on masonry construction, flooring, and roofing. Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super structures
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.

TEXTBOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

REFERENCES:

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2002.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
4. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.

OBJECTIVES:

- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material. □

UNIT I ENERGY PRINCIPLES 12

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings), shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams, plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT II INDETERMINATE BEAMS 12

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDERS 12

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS 12

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes – Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

UNIT V ADVANCED TOPICS 12

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to

- Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.
- Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.
 - find the load carrying capacity of columns and stresses induced in columns and cylinders
 - Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure
- Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams.

TEXTBOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi,2015.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II,Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series,Tata McGraw Hill Publishing company, 2007.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi,2012

OBJECTIVE:

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I	UNIFORM FLOW	12
Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energy and specific force – Critical flow .		
UNIT II	GRADUALLY VARIED FLOW	12
Dynamic equations of gradually varied flows – Types of flow profiles - Classifications: Computation by Direct step method and Standard step method – Control section – Break in Grade – Computation.		
UNIT III	RAPIDLY VARIED FLOW	12
Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Celerity – Rapidly varied unsteady flows (positive and negative surges)		
UNIT IV	TURBINES	12
Impact of Jet on flat, curved plates, Stationary and Moving –Classification of Turbines – Pelton wheel – Francis turbine – Kaplan turbine - Specific speed – Characteristic Curves of Turbines-Draft tube and cavitation.		
UNIT V	PUMPS	12
Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump - NPSH - Multistage pumps – Characteristics curve - Reciprocating pumps - Negative slip - Indicator diagrams and its variations – Air vessels - Savings in work done.		

TOTAL: 45 PERIODS**OUTCOMES:**

On completion of this course the students will be able to

- Apply their knowledge of fluid mechanics in addressing problems in open channels. □ Able to identify a effective section for flow in different cross sections. □
- To solve problems in uniform, gradually and rapidly varied flows in steady state conditions. □ Understand the principles, working and application of turbines. Understand the principles, working and application of pumps.

TEXTBOOKS:

1. Subramanya.K, "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
2. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
3. Chandramouli P.N., "Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.

REFERENCES:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry.M., "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
5. Subramanya.K., " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

OBJECTIVE:

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

UNIT I CONSTITUENT MATERIALS 9

Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES 9

Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

UNIT III PROPORTIONING OF CONCRETE MIX 9

Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

UNIT V SPECIAL CONCRETES 9

Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to understand

- The various requirements of cement, aggregates and water for making concrete
- The effect of admixtures on properties of concrete
- The concept and procedure of mix design as per IS method
- The properties of concrete at fresh and hardened state
- The importance and application of special concretes.

TEXTBOOKS:

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
3. Bhavikatti.S.S, “ Concrete Technology”, I.K.International Publishing House Pvt. Ltd., NewDelhi, 2015
4. Santhakumar. A.R., “Concrete Technology”, Oxford University Press India, 2006.

REFERENCES:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, NewDelhi, 2007
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, NewDelhi, 1998.
4. Job Thomas, “Concrete Technology”, Cengage Learning India Pvt. Ltd., Delhi, 2015
5. Kumar P Mehta., Paulo J M Monterio., “Concrete - Microstructure, Properties and Materials”, McGraw Hill Education (India) Private Limited, New Delhi, 2016.

OBJECTIVE:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena— Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems Sheet pile and weir.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium – Boussinesq's theory – (Point load, Line load and udl) Use of Newmark's influence chart – Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – \sqrt{t} and $\log t$ methods. e - $\log p$ relationship consolidation settlement N-C clays – O.C clays – Computation.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.

UNIT V SLOPE STABILITY 9

Infinite slopes and finite slopes — Friction circle method – Use of stability number – Guidelines for location of critical slope surface in cohesive and $c - \phi$ soil – Slope protection measures.

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to

- classify the soil and assess the engineering properties, based on index
- properties. Understand the stress concepts in soils
- Understand and identify the settlement in
- soils. Determine the shear strength of soil
- Analyze both finite and infinite slopes.

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

REFERENCES:

1. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations: Basic Geotechnics”.Prentice-Hall, 2006.
2. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of IndiaPvt. Ltd. New Delhi, 2010.
3. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India PrivateLimited, 8th Edition, 2014.
4. Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private LimitedDelhi, 2013.
5. Craig.R.F., “Soil Mechanics”, E & FN Spon, London and New York, 2012.
6. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”,2nd Edition, PearsonEducation, 2013.
7. Venkatramaiah.C., “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi,2017

OBJECTIVE:

- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS

1. Tension test on steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring

TOTAL: 60 PERIODS**OUTCOME:**

- The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

REFERENCES:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS 1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity
1.	UTM of minimum 400 kN capacity	1
2.	Torsion testing machine	1
3.	Izod impact testing machine	1
4.	Hardness testing machine Rockwell Vicker's (any 2) Brinell	1 each
5.	Beam deflection test apparatus	1
6.	Extensometer	1
7.	Compressometer	1
8.	Dial gauges	Few
9.	Le Chatelier's apparatus	2
10.	Vicat's apparatus	2
11.	Mortar cube moulds	10

OBJECTIVE:

- – □ Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS**A. Flow Measurement**

1. Calibration of Rotameter
2. Calibration of Venturimeter / Orificemeter
3. Bernoulli's Experiment

B. Losses in Pipes

4. Determination of friction factor in pipes
5. Determination of minor losses

C. Pumps

6. Characteristics of Centrifugal pumps
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump

D. Turbines

10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine/Kaplan turbine

E. Determination of Metacentric height

12. Determination of Metacentric height of floating bodies

TOTAL: 60 PERIODS**OUTCOMES:**

- The students will be able to measure flow in pipes and determine frictional losses. The students will be able to develop characteristics of pumps and turbines.

REFERENCES:

1. Sarbjit Singh. "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing Company, 2001.

LIST OF EQUIPMENTS

1. One set up of Rotometer
2. One set up of Venturimeter/Orifice meter
3. One Bernoulli's Experiment set up
4. One set up of Centrifugal Pump
5. One set up of Gear Pump
6. One set up of Submersible pump
7. One set up of Reciprocating Pump
8. One set up of Pelton Wheel turbine
9. One set up of Francis turbines/one set of Kaplan turbine
10. One set up of equipment for determination of Metacentric height of floating bodies
11. One set up for determination of friction factor in pipes
12. One set up for determination of minor losses.

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title Writing-Plan before writing-Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph.

UNIT II

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-Writing- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV

Reading- Genre and Organization of Ideas- Writing- Email writing- visumes – Job application-project writing-writing convincing proposals.

UNIT V

Reading- Critical reading and thinking- understanding how the text positions the reader- identify Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS**OUTCOMES:**

At the end of the course Learners will be able to: Write

- different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press:Oxford, 2011
2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford UniversityPress: Oxford, 2011

REFERENCES

1. Davis, Jason and Rhonda LIss.Effective Academic Writing (Level 3) Oxford University Press:Oxford, 2006
2. Suresh Kumar.E and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Blackswan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills.Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well andKnowing Why. Business & Professional Publishing: Australia, 2004

OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION 9+6

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS 9+6

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE 9+6

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams- Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS 9+6

Types of columns –Axially Loaded columns – Design of short Rectangula Square and circular columns – Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS 9+6

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 75 PERIODS

OUTCOMES:

Students will be able to

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
- design the various types of slabs and staircase by limit state
- method. Design columns for axial, uniaxial and biaxial eccentric
- loadings.
- Design of footing by limit state method.

TEXT BOOKS:

CIVIL – 2020R

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1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd., New Delhi, 2002.
2. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, NewDelhi, 2013.
4. Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & DistributorsPvt. Ltd., New Delhi.
5. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, NewDelhi

REFERENCES:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd.,New Delhi, 2002
3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw HillPublishing Company Ltd., 2009
4. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete",Laxmi Publication Pvt. Ltd., New Delhi, 2007.
5. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi,2008.
6. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, NewDelhi, 2000
7. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards,New Delhi, 1999
8. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", StructuresPublilcations, Pune, 2013

OBJECTIVE:

- To introduce the students to basic theory and concepts of classical methods of structural analysis

UNIT I STRAIN ENERGY METHOD 9

Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy).

UNIT II SLOPE DEFLECTION METHOD 9

Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements- symmetric frames with symmetric and skew-symmetric loadings.

UNIT III MOMENT DISTRIBUTION METHOD 9

Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

UNIT IV FLEXIBILITY METHOD 9

Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT V STIFFNESS METHOD 9

Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to

- Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strainenergy method
- Analyze the continuous beams and rigid frames by slope defection method.
- Understand the concept of moment distribution and analysis of continuous beams and rigid frameswith and without sway.
- Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames usingmatrix flexibility method.
- Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointedtrusses and rigid plane frames.

TEXTBOOKS:

1. Bhavikatti, S.S,Structural Analysis, Vol.1,& 2, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing HousePvt.Ltd.,New Delhi-4, 2014.
3. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
4. Pandit G.S.andGupta S.P.,Structural Analysis–AMatrix Approach, Tata McGraw Hill PublishingCompany Ltd.,2006

REFERENCES:

1. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications,New Delhi, 2004.
2. William Weaver, Jrand James M.Gere, Matrix analysis of framed structures, CBS Publishers &Distributors, Delhi,1995
3. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
4. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company,2005.
5. Rajasekaran. S, & G. Sankarasubramanian., “Computational Structural Mechanics”, PHILearning Pvt. Ltd, 2015
6. Negi L.S.and Jangid R.S.,Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2004.

OBJECTIVE:

- To equip the students with the principles and design of water treatment units and distribution system. □

UNIT I SOURCES OF WATER 12

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT II CONVEYANCE FROM THE SOURCE 12

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III WATER TREATMENT 12

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clariflocculator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT 12

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange–Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances - MBR process

UNIT V WATER DISTRIBUTION AND SUPPLY 12

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs – Functions – Network design – Economics – Analysis of distribution networks -Computer applications – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL: 45 PERIODS**OUTCOMES:**

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
 - the knowledge in various unit operations and processes in water treatment □
 - treatment □ an ability to design the various functional units in water treatment □
 - treatment □ an understanding of water quality criteria and standards, and their relation to public health
- the ability to design and evaluate water supply project alternatives on basis of chosen criteria. □

TEXTBOOKS:

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

OBJECTIVE:

- To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation - Strength parameters - Bore log report and Selection of foundation.

UNIT II SHALLOW FOUNDATION 9

Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision

UNIT IV PILE FOUNDATION 9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to

- Understand the site investigation, methods and sampling. Get knowledge on bearing capacity and testing methods. Design shallow footings.
- Determine the load carrying capacity, settlement of pile foundation. Determine the earth pressure on retaining walls and analysis for stability.

TEXTBOOKS:

1. Murthy, V.N.S., “Text book of Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

REFERENCES:

1. Braja M Das, “Principles of Foundation Engineering” (Eighth edition), Cengage Learning 2014.
2. Kaniraj, S.R. “Design aids in Soil Mechanics and Foundation Engineering”, Tata McGrawHill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, “Foundation Analysis and design”, McGraw Hill Education, 5th Edition, 28th August 2015.
4. IS Code 6403 : 1981 (Reaffirmed 1997) “Bearing capacity of shallow foundation”, Bureau of Indian Standards, New Delhi.
5. IS Code 8009 (Part 1):1976 (Reaffirmed 1998) “Shallow foundations subjected to symmetrical static vertical loads”, Bureau of Indian Standards, New Delhi.
6. IS Code 8009 (Part 2):1980 (Reaffirmed 1995) “Deep foundations subjected to symmetrical static vertical loading”, Bureau of Indian Standards, New Delhi.
7. IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) “Concrete Piles” Bureau of Indian Standards, New Delhi.
8. IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) “Timber Piles”, Bureau of Indian Standards, New Delhi.
9. IS Code 2911 (Part 3) : 1979 (Reaffirmed 1997) “Under Reamed Piles”, Bureau of Indian Standards, New Delhi.
10. IS Code 2911 (Part 4) : 1979 (Reaffirmed 1997) “Load Test on Piles”, Bureau of Indian Standards, New Delhi.
11. IS Code 1904: 1986 (Reaffirmed 1995) “Design and Construction of Foundations in Soils”, Bureau of Indian Standards, New Delhi.
12. IS Code 2131: 1981 (Reaffirmed 1997) “Method for Standard Penetration test for Soils”, Bureau of Indian Standards, New Delhi.
13. IS Code 2132: 1986 (Reaffirmed 1997) “Code of Practice for thin – walled tube sampling for soils”, Bureau of Indian Standards, New Delhi.
14. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.
15. IS Code 14458 (Part 1) : 1998 “Retaining Wall for Hill Area – Guidelines, Selection of Type of Wall” , Bureau of Indian Standards, New Delhi.
16. IS Code 14458 (Part 2) : 1998 “Retaining Wall for Hill Area – Guidelines, Design of Retaining/Breast Walls” , Bureau of Indian Standards, New Delhi.
17. IS Code 14458 (Part 3) : 1998 “Retaining Wall for Hill Area – Guidelines, Construction Of Dry Stone Walls” , Bureau of Indian Standards, New Delhi.

OBJECTIVE:

To develop skills to test the soils for their index and engineering properties and to characterise the soil based on their properties.

EXERCISES:**1. DETERMINATION OF INDEX PROPERTIES 20**

- a. Specific gravity of soil solids
- b. Grain size distribution – Sieve analysis
- c. Grain size distribution - Hydrometer analysis
- d. Liquid limit and Plastic limit tests
- e. Shrinkage limit and Differential free swell tests 62

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS 12

- a. Field density Test (Sand replacement method and core cutter method)
- b. Determination of moisture – density relationship using standard Proctor compaction test.
- c. Determination of relative density (Demonstration only)

3. DETERMINATION OF ENGINEERING PROPERTIES 28

- a. Permeability determination (constant head and falling head methods)
- b. One dimensional consolidation test (Determination of Co-efficient of consolidation only) c.
- Direct shear test in cohesionless soil
- d. Unconfined compression test in cohesive soil
- e. Laboratory vane shear test in cohesive soil
- f. Tri-axial compression test in cohesionless soil (Demonstration only)
- g. California Bearing Ratio Test

TOTAL: 60 PERIODS**OUTCOME:**

- Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties.

REFERENCES:

1. “Soil Engineering Laboratory Instruction Manual” published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. Lambe T.W., “Soil Testing for Engineers”, John Wiley and Sons, New York, 1951. Digitized 2008.
3. Saibaba Reddy, E.Ramasastri, K. “Measurement of Engineering Properties of Soils” New age International (P)Limited Publishers, New Delhi, 2002.
4. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and Plastic limit apparatus	2 sets
4.	Shrinkage limit apparatus	3 sets
5.	Proctor Compaction apparatus	2 sets
6.	UTM of minimum of 20kN capacity	1
7.	Direct Shear apparatus	1
8.	Thermometer	2
9.	Sand replacement method accessories and core cutter method accessories	2
10.	Tri-axial Shear apparatus	1
11.	Three Gang Consolidation test device	1
12.	Relative Density apparatus	1
13.	Van Shear apparatus	1
14.	Weighing machine – 20kg capacity	1 No
15.	Weighing machine – 1kg capacity	3 No

COURSE OBJECTIVES:

1. To analyse the physical, chemical and biological characteristics of water and waste water
2. To quantify the dosage requirement for coagulation process
3. To study the growth of micro-organism and its quantificationTo quantify the sludge

Course Content:

1. Physical, Chemical and biological characteristics of water and wastewater
2. Jar test
3. Chlorine demand and residual test
4. Growth of micro-organism

COURSE OUTCOME:

On the completion of the course, the students will be able to:

- Quantify the pollutant concentration in water and wastewater
- Suggest the type of treatment required and amount of dosage required for the treatmentExamine the conditions for the growth of micro-organisms

TOTAL: 60 PERIODS

List of Experiments:

1. Determination of pH, Turbidity and conductivity
2. Determination of Hardness
3. Determination of Alkalinity and Acidity
4. Determination of Chlorides
5. Determination of Phosphates and Sulphates
6. Determination of iron and fluoride
7. Determination of Optimum Coagulant dosage
8. Determination of residual chlorine and available chlorine in bleaching powder
9. Determination of Oil, and Grease
10. Determination of suspended, settleable, volatile and fixed solids
11. Determination Dissolved Oxygen and BOD for the given sample
12. Determination of COD for given sample
13. Determination of SVI of Biological sludge and microscopic examination
14. Determination of MPN index of given water sample

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse - using Total station

2. Contouring

(i). Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line

(ii). Block Level/ By squares of size at least 100 Meter x 100 Meter atleast 20 Meter interval

(III). L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30M and C.S at every 90 M

3. Offset of Buildings and Plotting the Location

4. Sun observation to determine azimuth (guidelines to be given to the students)

5. Use of GPS to determine latitude and longitude and locate the survey camp location

6. Traversing using GPS

7. Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.

AIM:

To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to standard laboratory precautions and best practices for experimental work
- To provide orientation for basic mathematical computation useful in basic research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

PREREQUISITES:

Basic mathematical and experimental skills and exposure to window-based computer operations system.

UNIT I 9

Introduction to Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Research Design – Steps in selection and formulation of research problem - Steps in research – Criteria of Good Research, Problems Encountered by Researchers in India.

UNIT II 9

Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs. Development of a research plan, Formulation of Hypothesis – Sampling techniques – Sampling error and sample size. Literature types- compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III 9

Methods of data collection – Primary and secondary data – observation – interview – Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises. Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software

utilization in literature collection.

UNIT IV **9**

Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis-Uncertainty, accuracy and precision- Mean value; standard deviation; error on the mean- Using a spreadsheet for data analysis- Graphs and graph plotting-Least squares methods – descriptive statistics – elements of processing through computer- packages for analysis (Excel).

UNIT V **9**

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references, Technical Presentation.

TOTAL: 45 PERIODS

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.
6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

Course Outcomes

After the completion of the course, the students will be able to:

- Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
- Demonstrate an ability to design a business model canvas.
- Evaluate the various sources of raising finance for startup ventures.
- Understand the fundamentals of developing and presenting business pitching to potential investors.

Course Content**Module – I**

Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions- characteristics, traits and behavioral; entrepreneurial challenges.

Module-II

Module Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Module –III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Module-IV

Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Module – V

Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Books for References

- Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
- Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
- S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education(2006)
- T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill(2013)
- Osterwalder, Alex and Pigneur, Yves (2010) Business Model Generation.
- Kachru, Upendra, India Land of a Billion Entrepreneurs, Pearson
- Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Portfolio Penguin
- Bagchi, Subroto, (2012). MBA At 16: a Teenager's Guide to Business, Penguin Books

- Bansal, Rashmi, Stay Hungry Stay Foolish, CIIE, IIM Ahmedabad
- Bansal, Rashmi, (2013). Follow Every Rainbow, Westland.
- Mitra, Sramana (2008), Entrepreneur Journeys (Volume 1), Booksurge Publishing
- Abrams, R. (2006). Six-week Start-up, Prentice-Hall of India.
- Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing.
- Johnson, Steven (2011). Where Good Ideas come from, Penguin Books Limited.
- Gabor, Michael E. (2013), Awakening the Entrepreneur Within, Primento.
- Guillebeau, Chris (2012), The \$100 startup: Fire your Boss, Do what you love and work better to live more, Pan Macmillan
- Kelley, Tom (2011), The ten faces of innovation, Currency Double day Prasad, Rohit (2013), Start-up sutra: what the angels won't tell you about business and life, Hachette India.

OBJECTIVE:

To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice for working stress and Limit state Method.

UNIT I INTRODUCTION AND ALLOWABLE STRESS DESIGN 9

Structural steel types – Mechanical Properties of structural steel- Indian structural steel products-Steps involved in the Design Process -Steel Structural systems and their Elements- -Type of Loads on Structures and Load combinations- Code of practices, Loading standards and Specifications - Concept of Allowable Stress Method, and Limit State Design Methods for Steel structures-Relative advantages and Limitations- Strengths and Serviceability Limit states. Allowable stresses as per IS 800 section 11 -Concepts of Allowable stress design for bending and Shear –Check for Elastic deflection-Calculation of moment carrying capacity –Design of Laterally supported Solid Hot Rolled section beams-Allowable stress design of Angle Tension and Compression Members and estimation of axial load carrying capacity.

UNIT II CONNECTIONS IN STEEL STRUCTURES 9

Type of Fasteners- Bolts Pins and welds- Types of simple bolted and welded connections Relative advantages and Limitations-Modes of failure-the concept of Shear lag-efficiency of joints- Axially loaded bolted connections for Plates and Angle Members using bearing type bolts –Prying forces and Hanger connection– Design of Slip critical connections with High strength Friction Grip bolts.-Design of joints for combined shear and Tension- Eccentrically Loaded Bolted Bracket Connections- Welds-symbols and specifications- Effective area of welds-Fillet and butt Welded connections-Axially Loaded connections for Plate and angle truss members and Eccentrically Loaded bracket connections.

UNIT III TENSION MEMBERS 9

Tension Members - Types of Tension members and sections –Behaviour of Tension Members-modes of failure-Slenderness ratio- Net area – Net effective sections for Plates ,Angles and Tee in tension –Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lag angles – Design of tension splice.

UNIT IV COMPRESSION MEMBERS 9

Types of compression members and sections–Behaviour and types of failures-Short and slender columns-Current code provisions for compression members- Effective Length, Slenderness ratio –Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns-Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded columns- Splices for columns.

UNIT V DESIGN OF FLEXURAL MEMBERS 9

Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and deflection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- Understand the concepts of various design philosophies
- Design common bolted and welded connections for steel structures
- Design tension members and understand the effect of shear lag.
- Understand the design concept of axially loaded columns and column base connections.
- Understand specific problems related to the design of laterally restrained and unrestrained steelbeams.

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd.,2013
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company,2005

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of SteelPublications, 2002
2. Sai Ram. K.S. "Design of Steel Structures " Dorling Kindersley (India) Pvt. Ltd., New Delhi,2nd Edition, 2015, www.pearsoned.co.in/kssairam
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, LearningPvt. Ltd., 2nd Edition, 2013
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IKInternational Publishing House Pvt. Ltd., 2009
5. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007, StructuresPublications, 2009.
6. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of IndianStandards, New Delhi, 2007
7. SP 6(1) Hand book on structural Steel Sections

OBJECTIVES:

- To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses.
- To analyse the arches, suspension bridges and space
- trusses. Also to learn Plastic analysis of beams and rigid frames.

UNIT I INFLUENCE LINES FOR DETERMINATE BEAMS 9

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAMS 9

Muller Breslau's principle – Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT III ARCHES 9

Arches - Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

UNIT IV CABLES AND SUSPENSION BRIDGES 9

Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders- cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT V PLASTIC ANALYSIS 9

Plastic theory – statically indeterminate structures-plastic moment of resistance-plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to

- Draw influence lines for statically determinate structures and calculate critical stress resultants. Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams. Analyse of three hinged, two hinged and fixed arches.
- Analyse the suspension bridges with stiffening girders
- Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

TEXTBOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.
2. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications, 2004.
3. Vazrani, V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

REFERENCES:

1. Negi, L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd. 2002.
3. Gambhir, M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt. Ltd., 2011.
4. Prakash Rao D.S., Structural Analysis, Universities Press, 1996.

OBJECTIVE:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I CROP WATER REQUIREMENT 9

Need and classification of irrigation- historical development and merits and demerits of irrigation-types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS 9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-

UNIT IV CANAL IRRIGATION 9

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On farm development works-Participatory irrigation management- Water resources associations-Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to

- Have knowledge and skills on crop water requirements. Understand the methods and management of irrigation. Gain knowledge on types of Impounding structures Understand methods of irrigation including canal irrigation.
- Get knowledge on water management on optimization of water use.

TEXTBOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.
4. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
5. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
6. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.
7. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi, 1999

OBJECTIVE:

- To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures - Highway drainage — Construction machineries.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation.

TOTAL: 60 PERIODS**OUTCOMES:**

Students will be able to

- Get knowledge on planning and aligning of highway.
- Geometric design of highways
- Design flexible and rigid pavements.
- Gain knowledge on Highway construction materials, properties, testing methods
- Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.

TEXTBOOKS:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers,2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications(India), Chennai, 2010
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications,8th edition Delhi, 2013.

REFERENCES:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision),IRC: 37-2012
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements forHighways, (Third Revision), IRC: 58-2012
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, SouthAsia, 2012
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA,2011
5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineeringand Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011
6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, NewDelhi, 2010
7. O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006
8. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, NewDelhi
9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements forHighways, New Delhi.

OBJECTIVE:

- The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage-Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Water ting.

UNIT II PRIMARY TREATMENT OF SEWAGE 9

Objectives – Unit Operations and Processes – Selection of treatment processes – Onsite sanitation - Septic tank- Grey water harvesting – Primary treatment – Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT III SECONDARY TREATMENT OF SEWAGE 9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor(SBR) – Membrane Bioreactor - UASB – Waste Stabilization Ponds – - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects.

UNIT IV DISPOSAL OF SEWAGE 9

Standards for– Disposal - Methods – dilution – Mass balance principle - Self purification of river- Oxygen sag curve – deoxygenation and reaeration - Streeter–Phelps model - Land disposal – Sewage farming – sodium hazards - Soil dispersion system.

UNIT V SLUDGE TREATMENT AND DISPOSAL 9

Objectives - Sludge characterization – Thickening - Design of gravity thickener- Sludge digestion– Standard rate and High rate digester design- Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances.

TOTAL: 45 PERIODS**OUTCOMES:**

The students completing the course will have

- An ability to estimate sewage generation and design sewer system including sewage pumpingstations
- The required understanding on the characteristics and composition of sewage, self-purification of streams
- An ability to perform basic design of the unit operations and processes that are used in sewage treatment

TEXTBOOKS:

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015.
2. Duggal K.N., “Elements of Environmental Engineering” S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim “Wastewater Treatment Plants”, CRC Press, Washington D.C., 2010
4. Gray N.F, “Water Technology”, Elsevier India Pvt. Ltd., New Delhi, 2006.

OBJECTIVE :

- To learn the principles and procedures of testing of highway materials

EXERCISES :**I TEST ON AGGREGATES**

- a) Specific Gravity
- b) Los Angeles Abrasion Test
- c) Water Absorption of Aggregates

II TEST ON BITUMEN

- a) Specific Gravity of Bitumen
- b) Penetration Test
- c) Viscosity Test
- d) Softening Point Test
- e) Ductility Test

III TESTS ON BITUMINOUS MIXES

- a) Stripping Test
- b) Determination of Binder Content
- c) Marshall Stability and Flow Values

IV DEMONSTRATION OF ANY ONE FIELD TESTING EQUIPMENT LIKE SKIDRESISTANCE TESTER/ BENKELMAN BEAM ETC**TOTAL: 60 PERIODS****OUTCOME:**

- Student knows the techniques to characterize various pavement materials through relevant tests.

REFERENCES:

1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009
2. Methods for testing tar and bituminous materials, IS 1201–1978 to IS 1220– 1978, Bureau of Indian Standards
3. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards
4. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition, 1997, Lexington, KY, USA.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No	Description of Equipment	Quantity
1.	Concrete cube moulds	6
2.	Concrete cylinder moulds	3
3.	Concrete Prism moulds	3
4.	Sieves	1 set
5.	Concrete Mixer	1
6.	Slump cone	3
7.	Flow table	1
8.	Vibrator	1
9.	Trowels and planers	1 set
10.	UTM – 400 kN capacity	1
11.	Vee Bee Consistometer	1
12.	Aggregate impact testing machine	1
13.	CBR Apparatus	1
14.	Blains Apparatus	1
15.	Los - Angeles abrasion testing machine	1
16.	Marshall Stability Apparatus	1

OBJECTIVE:

- At the end of the semester, the student shall conceive, design and draw the irrigation and environmental engineering structures in detail showing the plan, elevation and Sections.

PART A: IRRIGATION ENGINEERING

1. TANK COMPONENTS 9 Fundamentals of design - Tank surplus weir – Tank sluice with tower head - Drawings showing foundation details, plan and elevation

2. IMPOUNDING STRUCTURES

6

Design principles - Earth dam – Profile of Gravity Dam

3. CROSS DRAINAGE WORKS

6

General design principles - Aqueducts – Syphon aqueduct (Type III) – Canal drop (Notch Type) – Drawing showing plan, elevation and foundation details.

4. CANAL REGULATION STRUCTURES

9

General Principles - Direct Sluice - Canal regulator - Drawing showing detailed plan, elevation and foundation details.

PART B: ENVIRONMENTAL ENGINEERING

1. WATER SUPPLY AND TREATMENT

15

Design and Drawing of flash mixer, flocculator, clarifier – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply and drainage.

4. SEWAGE TREATMENT & DISPOSAL

15

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Trickling filter – Sludge digester – Sludge drying beds – Septic tanks and disposal arrangements.

TOTAL: 60 PERIODS

OUTCOME:

- The students after completing this course will be able to design and draw various units of Municipal water treatment plants and sewage treatment plants.

TEXTBOOKS:

1. Satya Narayana Murthy Challa, “Water Resources Engineering: Principles and Practice”, New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., “Irrigation Engineering and Design of Structures”, New Age International Publishers, New Delhi, 1997.
3. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
4. Manual on “Sewerage and Sewage Treatment Systems- Part A, B and C” CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

REFERENCES:

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy,2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.
3. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co.,New Delhi, 2002.
4. Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw-HillBookCo., New Delhi, 1995.
5. Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill,New Delhi,2010.
6. Qasim,S.R., Motley, E.M and Zhu.G. "Water works Engineering – Planning, Design and Operation",Prentice Hall, New Delhi, 2009.
7. Qasim, S. R. "Wastewater Treatment Plants, Planning, Design & Operation", CRC Press,New York,2010

OBJECTIVES: The course aims to:

- └ Enhance the Employability and Career Skills
 - └ of students Orient the students towards
 - └ grooming as a professional Make them
 - └ Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL :30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:

- **Make effective presentations**
- **Participate confidently in Group Discussions.**
- **Attend job interviews and be successful in them.**
- **Develop adequate Soft Skills required for the workplace**

Recommended Software

1. Globearena
2. Win English

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

OBJECTIVE:

- The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I QUANTITY ESTIMATION 9

Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer softwares)

UNIT II RATE ANALYSIS AND COSTING 9

Standard Data – Observed Data – Schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads– Cost Estimates (additional practice in class room using Computer softwares) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS 9

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digital signature certificates- Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS 9

Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V VALUATION 9

Definitions – Various types of valuations – Valuation methods - Necessity – Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease

TOTAL: 60 PERIODS**OUTCOMES:**

The student will be able to

- Estimate the quantities for buildings,
- Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
- Understand types of specifications, principles for report preparation, tender notices types.Gain knowledge on types of contracts
- Evaluate valuation for building and land.

TEXTBOOKS:

1. B.N Dutta ‘Estimating and Costing in Civil Engineering’, UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, ‘Civil Engineering Contracts and Estimates’, University Press, 2006
3. D.N. Banerjee, ‘Principles and Practices of Valuation’, V Edition, Eastern Law House, 1998

REFERENCES:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003

OBJECTIVE:

- To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and harbour

UNIT I RAILWAY PLANNING AND CONSTRUCTION 10

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 8

Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities- Signalling

UNIT III AIRPORT PLANNING 7

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area

UNIT IV AIRPORT DESIGN 10

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 10

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011

TOTAL: 60 PERIODS**OUTCOMES:**

Students who successfully complete this course will be able to:

- Understand the methods of route alignment and design elements in Railway Planning and Constructions.
- Understand the Construction techniques and Maintenance of Track laying and Railway stations. Gain an insight on the planning and site selection of Airport Planning and design.
- Analyze and design the elements for orientation of runways and passenger facility systems.
- Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications(India), Chennai, 2010
2. Saxena Subhash, C. and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998
3. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 1994

REFERENCES:

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013

OBJECTIVE:

- This course aims at providing students with a solid background on the principles of structural engineering design. Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures.

UNIT I RETAINING WALLS 9+6

Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surcharge– Design of Shear Key–Design and Drawing.

UNIT II FLAT SLAB and BRIDGES 9+6

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and drawing.

UNIT III LIQUID STORAGE STRUCTURE 9+6

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks– Hemispherical Bottomed Steel Water Tank –Design and Drawing

UNIT IV INDUSTRIAL STRUCTURES 9+6

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT V GIRDERS AND CONNECTIONS 9+6

Plate Girders – Behaviour of Components–Deign of Welded Plate Girder–Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections.

TOTAL: 75 PERIODS

Design and Drawing Exercises for practical component Part A**- RCC Structures**

1. Rectangular Column and Footing
2. Combined footing with Two columns
3. RCC one way & Two way Slab and beam system
4. Cantilever Retaining wall
5. RCC T beam bridge deck
6. Underground Rectangular Water Tank
7. Elevated circular water

TankPart B- Steel Structures

1. Built up column, column base and Foundation
2. Simple Steel Roof Trusses
3. Industrial building Elements
4. Plate Girder (welded)
5. Framed Connections and Detailing
6. Gantry girder
7. Steel water Tank

STRUCTURAL DESIGN AND DRAWING	Theory Examination		Practicals	
	Question paper Pattern	Marks to awarded	Question paper Pattern	Marks to awarded
This paper is a theory cum practical course weightage for theory 80% and for practical 20%	Five Either/Or type questions 5 x20 = 100 marks : covering all the five units Total Duration of Examination will be 3 hours Each Question include Design - 12 Marks Free hand Drawing (Not to scale) - 8 marks	Theoretical component Marks will carry 80% weightage. End Semester Examination will be conducted by COE	2 Questions, one from Part A - RCC Structures & one from Part B- Steel Structures	Practical component Marks will carry 20% weightage. Practical Examination will be conducted by the respective institution as internal mode.

OUTCOMES:

At the end of the course the student will be able to

1. Design and draw reinforced concrete Cantilever and Counter fort Retaining Walls
Design and draw flat slab as per code provisions
2. Design and draw reinforced concrete and steel bridges
3. Design and draw reinforced concrete and steel water tanks
4. Design and detail the various steel trusses and cantry girders

TEXTBOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D, Structural Design and Drawing Voll, II and III, CBS Publishers, 2010.
2. Shah V L and Veena Gore, Limit State Design of Steel Structures
3. IS800-2007, Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.
5. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi
6. IS 800 (2007) Indian Standard General Construction In Steel—Code of Practice, Bureau of Indian Standards, New Delhi.
7. IS 875 Part 1 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Dead Load, Bureau of Indian Standards, New Delhi.
8. IS 875 Part 2 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Imposed Load, Bureau of Indian Standards, New Delhi.
9. IS 875 Part 3 (2003) Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Code of Practice-Wind Load, Bureau of Indian Standards, New Delhi.
10. IS 3370 Part 1 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice—General Requirements, Code of Practice, Bureau of Indian Standards, New Delhi.
11. IS 3370 Part 2 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice-Reinforced Concrete Structures, Code of Practice, Bureau of Indian Standards, New Delhi.
12. IS 3370—Part 4 (2008) Indian Standard Code of Practice for Concrete Structures for The Storage of Liquids-Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.
13. IS 804 (2008) Indian Standard Specification for Rectangular Pressed Steel Tanks, Code of Practice, Bureau of Indian Standards, New Delhi.
14. IS 805 (2006) Indian Standard Code of Practice for Use of Steel in Gravity Water Tanks, Code of Practice, Bureau of Indian Standards, New Delhi.
15. IRC 112-2011, Code of Practice for Concrete Road Bridges, The Indian Roads Congress, New Delhi.
16. IRC 6-2014, Standard Specifications and Code of Practice for Road Bridges Section: II- Loads and Stresses, The Indian Roads Congress, New Delhi.

OBJECTIVE:

- To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

TOTAL: 60 PERIODS**STRATEGY**

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

OBJECTIVE:

- To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

STRATEGY:

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:

At the end of the course the student will be able to understand

- The intricacies of implementation textbook knowledge into practice
- The concepts of developments and implementation of new techniques

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 300 PERIODS**OUTCOME:**

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

VALUES OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority
 – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, — Ethics in Engineering, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, — Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, —Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases, Cengage Learning, 2009.
3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility, McGraw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, _ Value Education', Vethathiri publications, Erode, 2011.

OBJECTIVES:

To introduce the fundamentals and components of Geographic Information System
To provide details of spatial data structures and input, management and output processes.

UNIT I FUNDAMENTALS OF GIS 9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS 9

Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models.

UNIT III DATA INPUT AND TOPOLOGY 9

Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input – Digitiser – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration

UNIT IV DATA QUALITY AND STANDARDS 9

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure

UNIT V DATA MANAGEMENT AND OUTPUT 9

Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.

TOTAL: 45 PERIODS**OUTCOMES:**

This course equips the student to

- Have basic idea about the fundamentals of GIS. Understand the types of data models.
- Get knowledge about data input and topology. Gain knowledge on data quality and standards.

Understand data management functions and data output

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

REFERENCE:

1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

OBJECTIVES:

- To introduce the need for prestressing in a structure
- To explain the methods, types and advantages of prestressing to the students.
- To make the students to design a prestressed concrete structural elements and systems
- To introduce the students the effect of prestressing in the flexural and shear behaviour of structural elements.

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 12

Basic concepts – Advantages and disadvantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT II DESIGN FOR FLEXURE AND SHEAR 12

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 12

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAM 12

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V TENSION AND COMPRESSION MEMBERS 12

Role of prestressing in members subjected to Tensile forces and compressive forces - Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 60 PERIODS**OUTCOMES:**

On successful completion of this course, students will be able to:

- Understand the behaviour of prestressed concrete members and able to analyze the prestressed concrete beams.
- Design the prestressed concrete members for flexure and shear as per the relevant design code (IS1343).
- Analyze for deflection of prestressed concrete members and design the anchorage zone. Analyze and design of composite beams and continuous beams.
- Design of prestressed concrete structures - sleepers, Tanks, pipes and poles.

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt.

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley IndiaPvt. Ltd., New Delhi, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi,2012
5. IS 3370- Part 4 (2008) Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice, bureau of Indian standards, new Delhi.

OBJECTIVE:

- To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods. □

UNIT I INTRODUCTION 9

Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS 9

Behaviour and types of structural components – Large panel systems- roof and floor slabs- Walls panels - Beams - Columns - Shear walls

UNIT III DESIGN PRINCIPLES 9

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS 9

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

OUTCOMES:

1. The student will have good knowledge about design principles, layout of factory and stages of loading in precast construction.
2. Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.
3. Acquire knowledge about types of floor systems, stairs and roofs used in precast construction. Acquire knowledge about types of walls used in precast construction, sealants, design of joints. Acquire knowledge about components in industrial building.

TEXTBOOKS:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA, 1991.
2. Lewitt, M. "Precast Concrete- Materials, Manufacture, Properties And Usage", Applied Science Publishers, London And New Jersey, 1982.
3. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Beton Verlag, 2009.

COURSE OBJECTIVE

- To provide an understanding of the concept of energy consumption in buildings and design an energy efficient building

UNIT I INTRODUCTION 9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING 9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds – Cool Pools Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts – Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION 9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On completion of this course, the student is expected to be able to

- CO1** Explain environmental energy supplies on buildings
- CO2** Explain the passives of heating, cooling system
- CO3** Discuss the various aspects of day-lighting and electrical lighting in a building
- CO4** Predict and design building ventilation and heat control for indoor comfort
- CO5** Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations

REFERENCES

1. Energy Conservation Building Code, Code of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995
3. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
4. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc, 3rd Edition, 2014
5. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.

COs- PO's & PSO's MAPPING

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	-	-	-	3	3	2
PO3	Design/development of solutions	2	2	2	3	3	3
PO4	Investigation	-	-	-	-	1	2
PO5	Modern Tool Usage	-	-	-	-	2	1
PO6	Individual and Teamwork	1	-	-	-	-	1
PO7	Communication	-	-	-	1	1	1
PO8	Engineer and Society	3	3	3	3	3	3
PO9	Ethics	2	-	-	-	2	2
PO10	Environment and Sustainability	3	3	3	3	3	3
PO11	Project Management and Finance	-	-	-	-	-	-
PO12	Life Long Learning	3	-	-	-	-	3
PSO1	Knowledge of Construction Engineering & Management discipline	3	3	3	3	2	3
PSO2	Critical analysis of Construction management problems and innovation	2	2	2	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Construction Issues	1	1	2	3	3	3

Course Objectives:

Students will gain

1. Understanding of energy conservation options in various industrial processes.
2. The knowledge of tools and techniques for energy auditing.
3. About Energy Audit report including economic feasibility.

UNIT I: ENERGY SCENARIO**9**

Primary and Secondary Energy, Commercial and Non-commercial Energy, Renewable and Non-Renewable Energy, Global and Indian Energy Scenario, Growing Energy Needs and Long-Term Energy Scenario for India, Energy Pricing in India, Energy Sector Reforms, Energy Security, Energy Strategy for the Future, Basics of Energy and Its Various Forms: Various Forms of Energy, Electrical Energy Basics, Thermal Energy Basics, Units and Conversions Energy

UNIT II: MATERIAL AND ENERGY BALANCE**9**

Basic Principles, The Sankey Diagram and its Use, Material Balances, Energy Balances, Process Flow Chart, Facility as an Energy System, Energy Action Planning: Key elements, Formulation, Ratification. **Energy Audit:** ESCOs Energy Management & Government Programmes: BEE & State Development Agencies, Government & EESL Programmes, PAT Scheme, Ujala & SEEP Programmes, Municipal & Agriculture DSM Initiatives, Standards and Labelling Programme. Energy Audit: Types and Methodology, Energy Audit Report, Understanding Energy Costs, Maximizing System Efficiency, Fuel and Energy Substitution, Energy Audit Instruments

UNIT III: ENVIRONMENTAL AUDITING**9**

Definition and types of audits, Guidelines for environmental auditing, methodologies for Environmental Auditing, Matrix methods and Battelle method of auditing, Types of projects requiring Environmental Clearance, EAC, EIA M. Tech. Energy & Environmental Engineering Scheme and Syllabus (w.e.f. 2020-21) 40 case studies, Legal requirements for environmental auditing. Restoration and rehabilitation technologies, Environmental planning, urban planning, rural planning and land use pattern.

UNIT IV: ENVIRONMENTAL IMPACT ASSESSMENT**9**

Environment Impact Assessment (EIA) - Principles, Origin, development, types, issues, problems and limitations, environmental management plan, environmental impact statement (EIS), Strategic Environmental Assessment (SEA), EIA guidelines (1994) and notifications (Govt. of India 2006), Scope of EIA in project planning and implementation, Indian directions of EIA. Monitoring tools for EIA, surveys, spatial databases, experiments, models, Decision support system, Sources and collection of data for EIA, various appendices and forms for application.

UNIT V: COMPONENTS OF EIA**9**

EIA methodology – project screening, scoping, base line data, impact identification, prediction, evaluation, mitigation. Assessment techniques – cost benefit analysis, analysis of alternatives, methods of prediction matrices, networks, checklists and overlays and assessment of impacts – air, water, soil, noise, biological, social, cultural, economical, environmental factors. EIA standards and guidelines, public participation- procedure of public hearing, presentation, review and decision making. Quality control – trends in EIA practice, evaluation criteria, expert system in EIA, use of regulations. Documentation and monitoring – Generic structure of EIA Document, planning, collection, use of display materials, team writing, checklist, environmental monitoring guidelines and policies, post audit.

TOTAL: 45 PERIODS

Course Outcomes:

The students will be able to:

CO1: To identify the key aspects of energy and environmental audit

CO2: Lay foundation on the concept and components of energy and environmental auditing and environmental impact assessment.

CO3: Develop skill to evaluate the issues and problems in energy and environmental auditing and environmental impact assessment from the perspective of process, methods, and goals.

CO4: Be able to access different case studies/examples of EIA in practice

CO5: Learn to write EIA report M. Tech. Energy & Environmental Engineering Scheme and Syllabus (w.e.f. 2020-21) 41

REFERENCES:

1. LC Witte, PS Schmidt and DR Brown: Industrial Energy Management and Utilization

(Hemisphere Publishing Corporation, Washington, 1998).

2. Howard E. Jordan, Energy-Efficient Electric Motors and Their Applications., Plenum Pub Corp; 2nd edition (1994)

3. Giovanni Petrecca. Industrial Energy Management: Principles and Applications. The Kluwer international series -207, 1999.

4. WC Turner: Energy Management Handbook, Seventh Edition, (Fairmont Press Inc., 2007)

5. George Polimeros: Energy Cogeneration Handbook, (Industrial Press, Inc., New York, 1981)

6. Handbook on Energy Audit and Environment Management, Y P Abbi and Shashank Jain, TERI,2006

7. Handbook of Energy Audits Albert Thumann, William J. Younger, Terry Niehus,2009

8. Kulkarni, V. and Ramachandra, T.V. Environmental Management. Capital Pub. Co., New Delhi. 2006.

9. Petts, J. Handbook of Environmental Impact Assessment- Volume 1 and 2. Blackwell Publishers, UK 2005.

10. Glasson, J. Therivel, R. and Chadwick, A. Introduction to Environmental Impact Assessment. Routledge, London. 2006.

OBJECTIVES:

1. To have an increased awareness among students on issues in the area of Sustainability
2. To understand the role of engineering and technology within sustainable development.
3. To know the methods, tools and incentives for sustainable product-service system development.

UNIT I INTRODUCTION

9

Sustainability-Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable Development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act

UNIT II SUSTAINABLE DESIGN

9

Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

UNIT III SUSTAINABLE DESIGN

9

Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design. Sustainable cities, Sustainable transport.

UNIT IV SUSTAINABLE DESIGN

9

Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design. Sustainable cities, Sustainable transport.

UNIT V CLEAN TECHNOLOGY AND ENERGY

9

Energy sources: Basic concepts Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, biofuels, Energy Derived from oceans, Geothermal energy. Rain water harvesting.

TOTAL: 45 PERIODS

REFERNCES:

1. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society

OBJECTIVES:

Overview of smart materials, Piezoelectric Ceramics, Piezo-polymers, Magnetostrictive Materials, Electroactive Polymers, Shape Memory Alloys, Electro and Magneto Rheological Fluids, Modelling of smart materials, introduction to composite smart materials, Mechanics of smart composite materials, Smart sensors based on high bandwidth low strain smart materials, Low-bandwidth high strain smart actuators, Micro-electro mechanical Smart Systems, Intelligent devices based on smart materials, Applications of Smart Actuators: Active and Hybrid Vibration Control, Active Shape Control, Distributed Sensing and Control of Smart Beams.

UNIT I OVERVIEW OF SMART MATERIALS**9**

Introduction to Smart Materials, Principles of Piezoelectricity, Perovskite Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rheological Fluids.

UNIT II HIGH-BAND WIDTH, LOW STRAIN SMART SENSORS**9**

Piezoelectric Strain Sensors, In-plane and Out-of Plane Sensing, Shear Sensing, Accelerometers, Effect of Electrode Pattern, Active Fibre Sensing, Magnetostrictive Sensing, Villari Effect, Matteuci Effect and Nagoka-Honda Effect, Magnetic Delay Line Sensing, Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors

UNIT III SMART ACTUATORS**9**

Modelling Piezoelectric Actuators, Amplified Piezo Actuation – Internal and External Amplifications, Magnetostrictive Actuation, Joule Effect, Wiedemann Effect, Magnetovolume Effect, Magnetostrictive Mini Actuators, IPMC and Polymeric Actuators, Shape Memory Actuators, Active Vibration Control, Active Shape Control, Passive Vibration Control, Hybrid Vibration Control

UNIT IV SMART COMPOSITES**9**

Review of Composite Materials, Micro and Macro-mechanics, Modelling Laminated Composites based on Classical Laminated Plate Theory, Effect of Shear Deformation, Dynamics of Smart Composite Beam, Governing Equation of Motion, Finite Element Modelling of Smart Composite Beams

UNIT V ADVANCES IN SMART STRUCTURES & MATERIALS**9**

Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, SelfHealing Polymers, Intelligent System Design, Emergent System Design.

TOTAL: 45 PERIODS**REFERENCES:**

- (a) Brian Culshaw, Smart Structures and Materials, Artech House, 2000
- (b) Gauenzi, P., Smart Structures, Wiley, 2009
- (c) Cady, W. G., Piezoelectricity, Dover Publication